Electromagnetic Compatibility Test Report

Prepared in accordance with

FCC Part 15 Subpart B:2018

On

Blade
Model 447

Prepared for:

Vuzix Corporation
25 Hendrex Rd
West Henrietta, NY 14586

Prepared by:

TUV Rheinland of North America, Inc.
1279 Quarry Lane, Ste. A
Pleasanton, CA 94566 U.S.A.

Revisions

Revision No.	Date	Reason for Change	Author
1	June 27, 2018	Original Document	BA

Note: Latest revision report will replace all previous reports.

ATTESTATION OF TEST RESULTS

Client:	Vuzix Corporation 25 Hendrex Rd West Henrietta, NY 14586		
Model Name:	Blade	***Serial Number:***	M004SW00012
Model Numbers:	447	***Date(s) Tested:***	June 26th-27th , 2018
Test Location:	TUV Rheinland of North America 1279 Quarry Lane, Ste. A Pleasanton, CA 94566 U.S.A. Tel. (925) 249-9123		
Test Specifications:	Emissions:	FCC Part 15 Subpart B:2018	
Test Result:	**The above product was found to be Compliant to the above test standard(s)**		

Prepared by: **Benjamin Atsu**	***Reviewed by:*** **Josie Sabado**
June 27, 2018 ***Date*** ***Name*** ***Signature***	June 27, 2018 ***Date*** ***Name*** ***Signature***
Other aspects:	**None**

PLEASANTON

US1131	**Testing Cert #3331.02**	**Innovation, Science and Economic Development Canada (ISED) 2932M-1**	**1097 (A-0261)**

TABLE OF CONTENTS

1 GENERAL INFORMATION 5

1.1 SCOPE 5
1.2 PURPOSE 5
1.3 SUMMARY OF TEST RESULTS 6

2 LABORATORY INFORMATION 7

2.1 ACCREDITATIONS & ENDORSEMENTS 7
2.2 TEST FACILITIES AND EMC SOFTWARE 8
2.3 MEASUREMENT UNCERTAINTY 8
2.4 CALIBRATION TRACEABILITY 9
2.5 MEASUREMENT EQUIPMENT USED 10

3 PRODUCT INFORMATION 10

3.1 PRODUCT DESCRIPTION 10
3.2 EQUIPMENT MODIFICATIONS 10
3.3 TEST PLAN 10

4 EMISSIONS 11

4.1 RADIATED EMISSIONS 11
4.2 CONDUCTED EMISSIONS 15

APPENDIX A 20

5 TEST PLAN 20

5.1 GENERAL INFORMATION 20
5.2 EUT DESIGNATION 20
5.3 EUT DESCRIPTION 20
5.4 EQUIPMENT UNDER TEST (EUT) DESCRIPTION 20
5.5 PRODUCT ENVIRONMENT(S) 20
5.6 APPLICABLE DOCUMENTS 21
5.7 EUT ELECTRICAL POWER INFORMATION 21
5.8 EUT CLOCK/OSCILLATOR FREQUENCIES 21
5.9 ELECTRICAL SUPPORT EQUIPMENT 22
5.10 NON - ELECTRICAL SUPPORT EQUIPMENT 22
5.11 EUT EQUIPMENT/CABLING INFORMATION 22
5.12 EUT TEST PROGRAM 22
5.13 EUT MODES OF OPERATION 22
5.14 EUT CONFIGURATION 22
5.15 EMISSIONS 23

1 General Information

1.1 Scope

This report is intended to document the status of conformance with the listed standards based on the results of testing performed on June 26th -27th, 2018 Model: 447, manufactured by Vuzix Corporation. This report only applies to the specific samples tested under the stated test conditions. It is the responsibility of the manufacturer to assure that additional production units of this model are manufactured with identical or EMI equivalent electrical and mechanical components. This report is further intended to document changes and modifications to the EUT throughout its life cycle. All documentation will be included as a supplement.

1.2 Purpose

Testing was performed to evaluate the EMC performance of the EUT (Equipment Under Test) in accordance with the applicable requirements, procedures, and criteria defined in the application of regulations and application of standards listed in this report.

1.3 Summary of Test Results

Applicant	Vuzix Corporation 25 Hendrex Rd West Henrietta, NY 14586
Description	Smart Glasses
Model Name	Blade
Model Number	447
Serial Number	M004SW00012
Input Power	USB
Test Date(s)	June 26th -27th, 2018
Environment	Nominal Voltage/Nominal Temperature

Standards	Description	Severity Level or Limit	Criteria	Test Result
FCC Part 15 Subpart B:2018	Radiated Emissions	Class B 30 MHz - 12.75 GHz	Limit	Complies
FCC Part 15 Subpart B:2018	Conducted Emissions	Class B 150 kHz - 30 MHz	Limit	Complies

2 Laboratory Information

2.1 Accreditations & Endorsements

2.1.1 US Federal Communications Commission

TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin ct, Fremont CA 94538 are recognized by the Commission for performing testing services for the general public on a fee basis. These laboratory test facilities have been fully described in reports submitted to and accepted by the FCC (Pleasanton/Fremont Registration No. US1131). The laboratory Scopes of Accreditation include Title 47 CFR Parts 15, 18 and 90. The accreditations are updated every three years.

2.1.2 A2LA

TUV Rheinland of North America EMC test facilities are accredited by the American Association for Laboratory Accreditation (A2LA). The laboratories have been assessed and accredited by A2LA in accordance with ISO Standard 17025:2005 (Testing Certificate #3331.02). The Scope of Laboratory Accreditation includes emission and immunity testing. The accreditations are updated annually.

2.1.3 Innovation, Science and Economic Development Canada (ISED)

The Pleasanton 5-meter Semi-Anechoic Chamber, Registration No. 2932M-1, has been accepted by Industry Canada to perform testing to 3 and 5 meters based on the test procedures described in ANSI C63.4-2014. The Fremont 10-meter Semi-Anechoic Chamber, Registration No. 2932D-1, has been accepted by Industry Canada to perform testing to 3 and 10 meters based on the test procedures described in ANSI C63.4-2014.

2.1.4 Japan – VCCI

The Voluntary Control Council for Interference by Information Technology Equipment (VCCI) is a group that consists of Information Technology Equipment (ITE) manufacturers and EMC test laboratories. The purpose of the Council is to take voluntary control measures against electromagnetic interference from Information Technology Equipment, and thereby contribute to the development of a socially beneficial and responsible state of affairs in the realm of Information Technology Equipment in Japan. TUV Rheinland of North America EMC test facilities located at 1279 Quarry Lane, Ste. A, Pleasanton, CA, 94566, and 5015 Brandin Court, Fremont, CA 94538, have been assessed and approved in accordance with the Regulations for Voluntary Control Measures.

VCCI Registration No.: A-0261

2.2 Test Facilities and EMC Software

Test facilities are located at 1279 Quarry Lane, Ste. A, Pleasanton, California 94566, U.S.A. and 5015 Brandin Ct, Fremont CA 94538 U.S.A. (Fremont is the Pleasanton Annex).

2.2.1 Emission Test Facility

The Semi-Anechoic Chambers and AC Line Conducted measurement facilities used to collect radiated and conducted emissions data have been constructed in accordance with ANSI C63.7:1992. The Fremont 10 meter semi-anechoic chamber has been measured in accordance with and verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04), at test distances of 3 and 10 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02). The Pleasanton 5 meter semi-anechoic chamber has been verified to comply with the theoretical volumetric normalized site attenuation of ANSI C63.4:2014 and SVSWR requirements of CISPR 16-1-4 Consol. Ed. 3.0 (2010-04) at a test distance of 3 meters. This site has been described in reports dated November 1st, 2006, submitted to the FCC, and accepted by letter dated November 28, 2006. The site is listed with the FCC and accredited by A2LA (Testing Certificate #3331.02).

2.2.2 EMC Software - Pleasanton

Manufacturer	Name	Version	Test Type
EMISoft	Vasona	5.0	Conducted Emissions
Rohde & Schwarz	EMC32	10.20.01	Radiated Emissions

2.3 Measurement Uncertainty

Two types of measurement uncertainty are expressed in this report, per *ISO Guide To The Expression Of Uncertainty In Measurement*, 1st Edition, 1995.

The Combined Standard Uncertainty is the standard uncertainty of the result of a measurement when that result is obtained from the values of a number of other quantities, equal to the positive square root of a sum of terms, the terms being the variances or co-variances of these other quantities weighted according to how the measurement result varies with changes in these quantities. The term standard uncertainty is the result of a measurement expressed as a standard deviation.

The Expanded Uncertainty defines an interval about the result of a measurement that may be expected to encompass a large fraction of the distribution of values that could reasonably be attributed to the measurand. The fraction may be viewed as the coverage probability or level of confidence of the interval.

2.3.1 Sample Calculation – radiated & conducted emissions

The field strength is calculated by subtracting the Amplifier Gain and adding the Cable Loss and Antenna Correction Factor to the measured reading. The basic equation is as follows:

Field Strength (dBµV/m) = RAW - AMP + CBL + ACF

Where: RAW = Measured level before correction (dBµV)

AMP = Amplifier Gain (dB)

CBL = Cable Loss (dB)

ACF = Antenna Correction Factor (dB/m)

$$\mu V/m = 10^{\frac{dB\mu V/m}{20}}$$

Sample radiated emissions calculation @ 30 MHz

Measurement +Antenna Factor–Amplifier Gain+Cable loss=Radiated Emissions (dBuV/m)

25 dBuV/m + 17.5 dB – 20 dB + 1.0 dB = 23.5 dBuV/m

2.3.2 Measurement Uncertainty Emissions

Per CISPR 16-4-2	**U_{lab}**	**U_{cispr}**
Radiated Disturbance @ 10 meters		
30 – 1,000 MHz	2.25 dB	4.51 dB
Radiated Disturbance @ 3 meters		
30 – 1,000 MHz	2.26 dB	4.52 dB
1 – 6 GHz	2.12 dB	4.25 dB
6 – 18 GHz	2.47 dB	4.93 dB
Conducted Disturbance @ Mains Terminals		
150 kHz – 30 MHz	1.09 dB	2.18 dB
Disturbance Power		

2.4 Calibration Traceability

All measurement instrumentation is traceable to the National Institute of Standards and Technology (NIST). Measurement method complies with ANSI/NCSL Z540-1-1994 and ISO Standard 17025:2005. Equipment calibration records are kept on file at the test facility.

2.5 Measurement Equipment Used

Equipment	Manufacturer	Model #	Serial/Inst #	Last Cal mm/dd/yy	Next Cal mm/dd/yy
Bilog Antenna	Sunol Sciences	JB3	A102606	06/15/2016	06/15/2018
Horn Antenna	Sunol Sciences	3115	9211-3969	05/16/2018	06/16/2020
Horn Antenna (18-40 GHz)	Com-Power	AHA-840	105005	01/16/2018	01/16/2019
Loop Antenna	EMCO	6502	9110-2683	05/23/2017	05/23/2019
Spectrum Analyzer	Rohde Schwarz	ESIB40	832427/002	01/22/2018	01/22/2019
Spectrum Analyzer	Rohde Schwarz	FSV40	101410	09/19/2017	09/19/2018
Amplifier	Sonoma Instruments	310	185516	01/25/2018	01/25/2019
Amplifier	Miteq	TTA1800-30-HG	1842452	01/13/2018	01/13/2019
Switch Unit / Power Sensors	Rohde & Schwarz	OSP120	101181	01/18/2018	01/18/2019
LISN	Com-Power	LI-215A	19200	01/24/2018	01/24/2019
10 dB Attenuator	Pasternack	N/A	N/A	N/A	N/A
3 dB Attenuator	Pasternack	N/A	N/A	N/A	N/A
1 dB Attenuator	Mini-Circuits	15542	VUU83701027	N/A	N/A
9 kHz – 30 MHz RF Cable	Coleman	RG214	RG214-60-01	N/A	N/A
1 – 18 GHz RF Cable	Huber & Suhner	Sucoflex	PL-A-33	N/A	N/A
18 – 40 GHz RF Cable	Huber & Suhner	Sucoflex	PL-N-31	N/A	N/A
9 kHz-1 GHz RF Cable	ETS-Lindgren	Ferrited	Pigtail5	N/A	N/A

3 Product Information

3.1 Product Description

See Section 5.3.

3.2 Equipment Modifications

None

3.3 Test Plan

The EUT product information, test configuration, mode of operation, test types, test procedures, test levels, pass/failure criteria, in this report were carried out per the product test plan located in Appendix A of this report.

4 Emissions

4.1 Radiated Emissions

This test measures the electromagnetic levels of spurious signals generated by the EUT that radiated from the EUT and may affect the performance of other nearby electronic equipment.

4.1.1 Overview of Test

Results	**Complies** (as tested per this report)			**Test Date(s)**		June 26th -27th, 2018	
Standard	FCC Part 15 Subpart B:2018						
Model Number	447			**Serial #**	M004SW00012		
Configuration	See test plan for details.						
Test Setup	Tested in the 5-meter chamber, placed on turntable: see test plan for details.						
EUT Powered By	USB						
Environmental Conditions	June 27, 2018	**Temp**	23º C	**Humidity**	37%	**Pressure**	1000 mbar
Frequency Range	30MHz-12.75 GHz						
Perf. Criteria	Class B		**Perf. Verification**		Readings Under Limit		
Mod. to EUT	Refer to Section 3.2		**Test Performed By**		Benjamin Atsu		

4.1.2 Test Procedure

Radiated emissions tests were performed using the procedures of ANSI C63.4:2014 including methods for signal maximizations and EUT configuration. The photos included with the report show the EUT in its maximized configuration.

The frequency range from 30MHz-12.75GHz was investigated for radiated emissions.

4.1.3 Deviations

There were no deviations from the test methodology listed in the test plan for the radiated emission test.

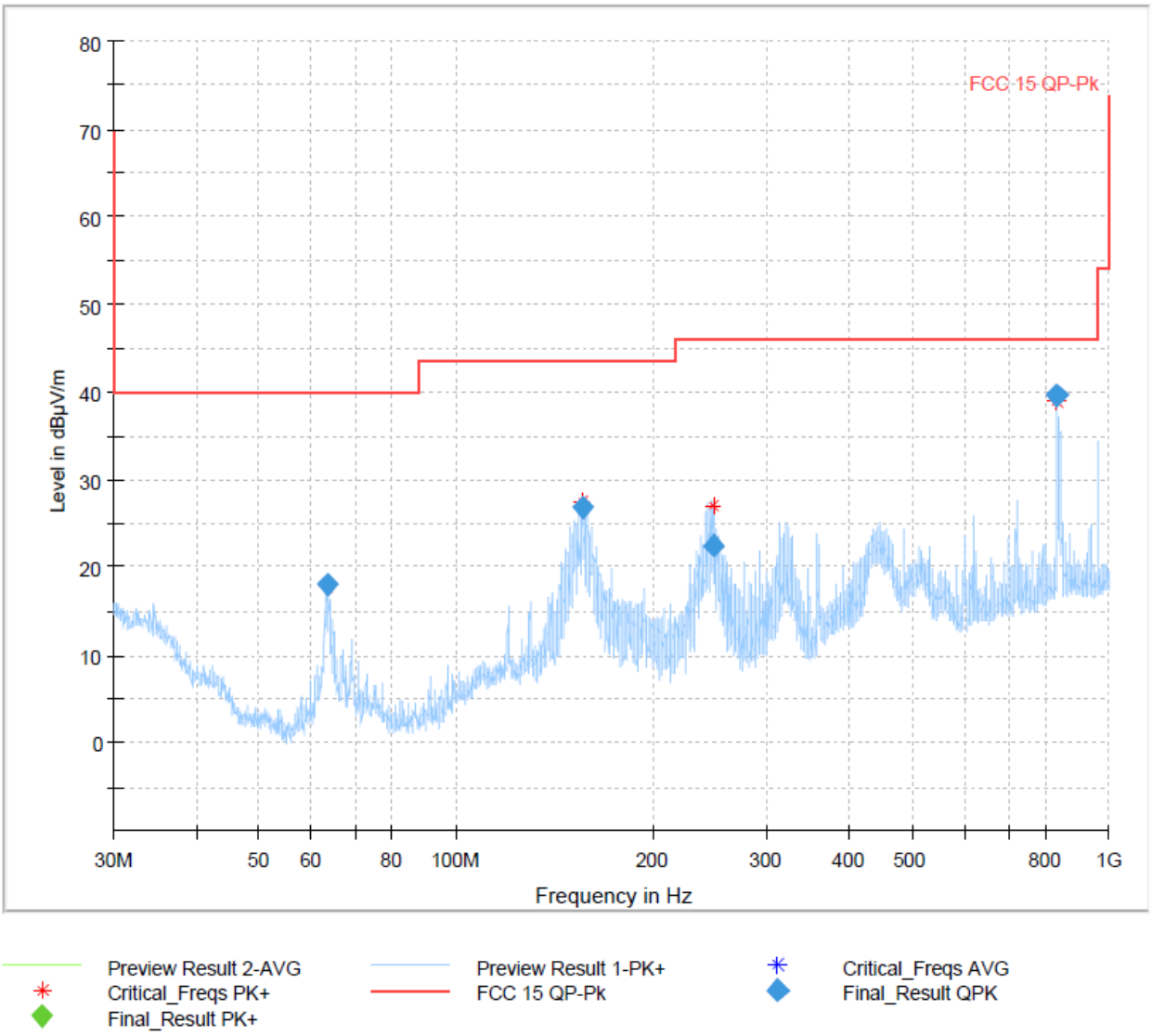
4.1.4 Final Test

All final radiated emissions measurements were below the specification limits.

4.1.5 Plots

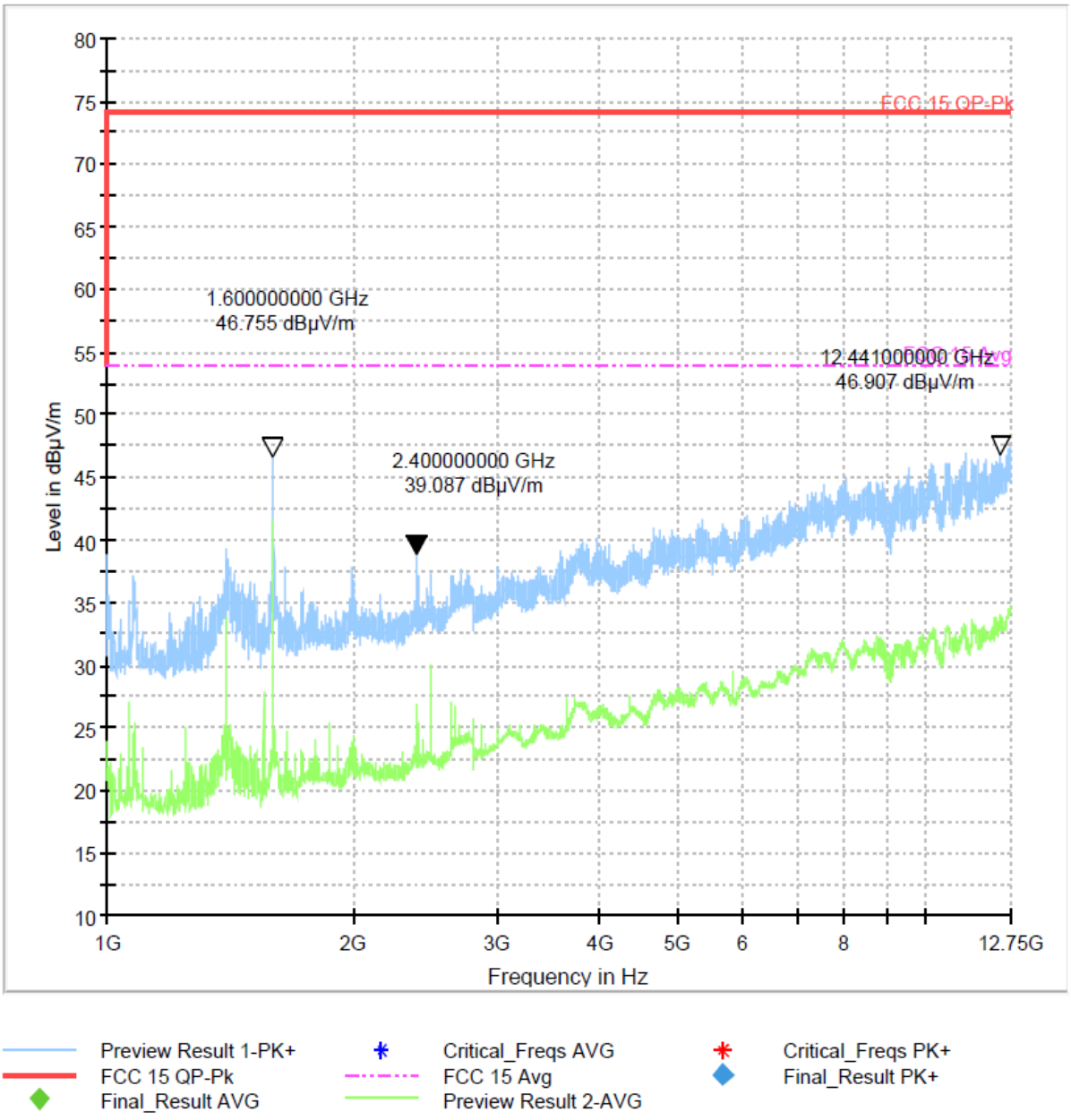
Note: 110V/ 60Hz

30 MHz to 1 GHz Radiated Emissions Full Scan
Vertical / Horizontal



Notes:

1 GHz to 12.75 GHz Radiated Emissions Full Scan
Vertical / Horizontal



Notes:

4.1.6 Final Tabulated Data – 30 - 1000 MHz

Frequency (MHz)	Quasi Peak (dBµ V/m)	MaxPeak (dBµ V/m)	Limit (dBµ V/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB)
63.350000	17.99	---	40.00	22.02	2.0	120.000	400.0	H	201.0	-22.8
156.350000	26.77	---	43.51	16.74	2.0	120.000	193.5	H	42.0	-17.7
246.900000	22.61	---	46.00	23.39	2.0	120.000	120.0	H	69.0	-18.2
832.000000	39.69	---	46.00	6.31	2.0	120.000	106.6	H	258.0	-6.5

4.2 Conducted Emissions

Testing was performed in accordance with ANSI C63.4: 2014. These test methods are listed under the laboratory's A2LA Scope of Accreditation.

This test measures the levels emanating from the EUT's AC input port, thus evaluating the potential for the EUT to cause radio frequency interference to other electronic devices.

The AC conducted emissions of equipment under test shall not exceed the values in CFR 47 Part 15.207 and RSS-GEN. Sect. 8.8.

4.2.1 Test Methodology

A test program that controls instrumentation and data logging was used to automate the AC Power Line Conducted emission test procedure. The frequency range of interest was divided into sub-ranges such as to yield a frequency resolution of 9 kHz. Each phase and neutral of the AC power line were measured with respect to ground. Measurements were performed using a set of 50µH / 50Ω LISNs.

Testing is performed in Lab 5. The vertical ground plane used in the semi-anechoic chamber is a 2m x 2m solid aluminum frame and panel, and it is bonded to the horizontal ground plane.

In the case of tabletop equipment, the EUT is placed on a 1.0m x 1.5m non-conductive table 80cm above the ground plane and 40cm from a vertical ground reference plane. The rear of the EUT was positioned flush with the backside of the table and directly over the LISNs. The power and I/O cables were routed over the edge of the table and bundled approximately 40cm from the ground plane. Support equipment was powered from a separate LISN.

4.2.2 Deviations

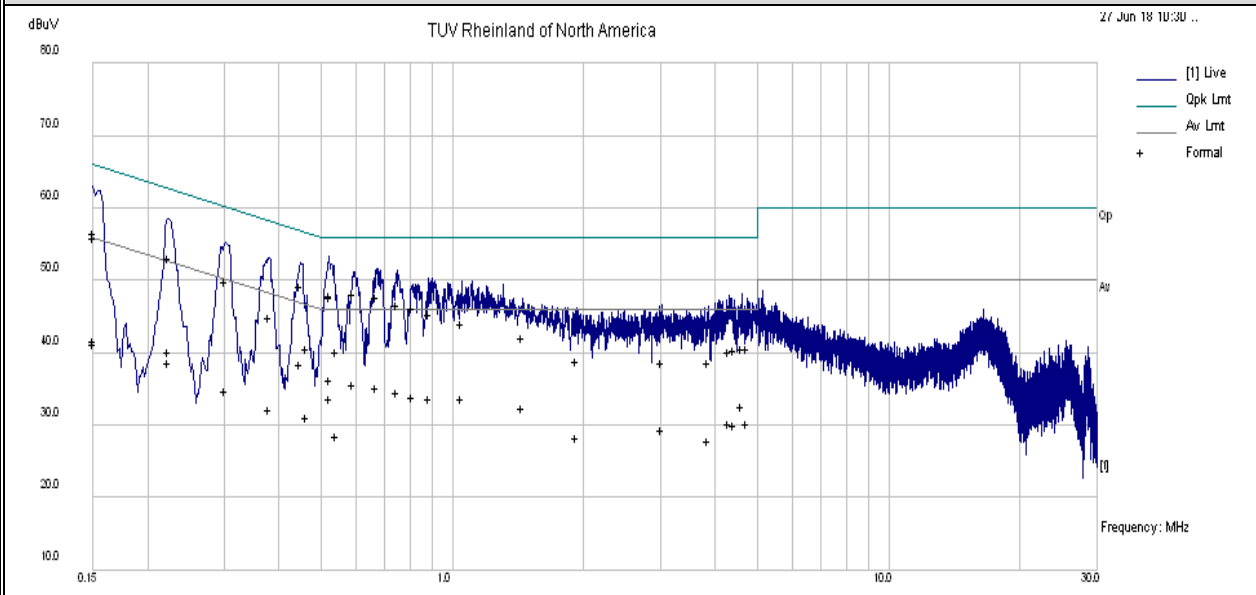
There were no deviations from this test methodology.

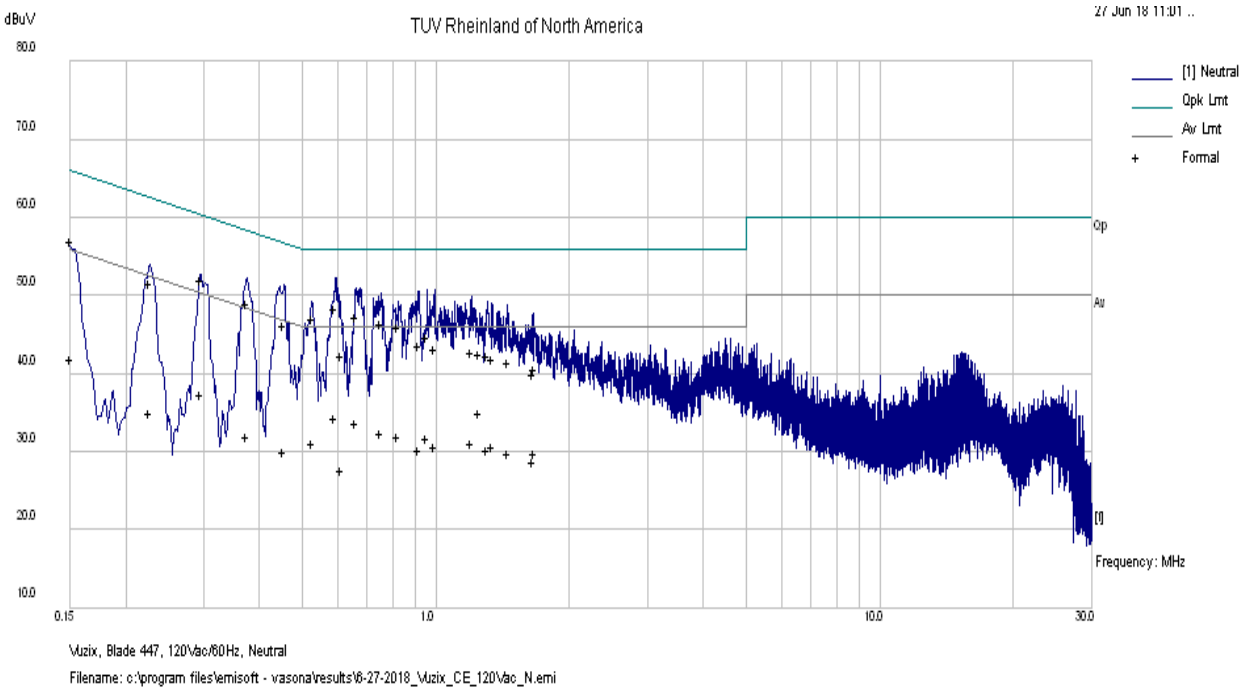
4.2.3 Test Results

As originally tested, the EUT was found to be compliant to the requirements of the test standard(s).

4.2.4 Plots

AC Line Conducted Emissions
Line/Neutral





Notes: 110V/60Hz

4.2.5 Final Tabulated Data

Line

Frequency MHz	Raw dBµV/m	Cable Loss	Ca Factor	Level dBµ/m	Detector	Line	Limit dBµV/m	Margin dB
0.447289	39.43	9.84	0.03	49.3	Quasi Peak	Live	56.93	-7.62
0.667918	37.84	9.86	0.03	47.72	Quasi Peak	Live	56	-8.28
0.746447	36.73	9.86	0.03	46.63	Quasi Peak	Live	56	-9.37
0.593128	38.35	9.85	0.03	48.23	Quasi Peak	Live	56	-7.77
0.301449	40.12	9.83	0.03	49.98	Quasi Peak	Live	60.2	-10.22
0.379978	35.13	9.84	0.03	45	Quasi Peak	Live	58.28	-13.28
0.882938	35.5	9.87	0.03	45.4	Quasi Peak	Live	56	-10.6
1.051214	34.27	9.87	0.03	44.17	Quasi Peak	Live	56	-11.83
0.808148	36.25	9.87	0.03	46.15	Quasi Peak	Live	56	-9.85
4.604589	30.68	9.92	0.03	40.62	Quasi Peak	Live	56	-15.38
4.31291	30.31	9.91	0.03	40.25	Quasi Peak	Live	56	-15.75
0.540776	30.22	9.84	0.03	40.1	Quasi Peak	Live	56	-15.9
4.731731	30.67	9.92	0.03	40.61	Quasi Peak	Live	56	-15.39
1.447599	32.23	9.88	0.03	42.13	Quasi Peak	Live	56	-13.87
0.462246	30.8	9.84	0.03	40.67	Quasi Peak	Live	56.65	-15.98
4.436313	30.38	9.91	0.03	40.32	Quasi Peak	Live	56	-15.68
3.02279	28.76	9.9	0.03	38.69	Quasi Peak	Live	56	-17.31
3.866042	28.77	9.91	0.03	38.7	Quasi Peak	Live	56	-17.3
1.924383	28.99	9.88	0.03	38.9	Quasi Peak	Live	56	-17.1
0.522078	38.09	9.84	0.03	47.97	Quasi Peak	Live	56	-8.03
0.15	46.02	9.82	0.06	55.9	Quasi Peak	Live	66	-10.1
0.22292	43.37	9.83	0.04	53.24	Quasi Peak	Live	62.71	-9.47
0.522078	37.98	9.84	0.03	47.85	Quasi Peak	Live	56	-8.15
0.22292	43.25	9.83	0.04	53.12	Quasi Peak	Live	62.71	-9.58
0.15	46.83	9.82	0.06	56.71	Quasi Peak	Live	66	-9.29
0.447289	28.51	9.84	0.03	38.38	Average	Live	46.93	-8.54
0.667918	25.33	9.86	0.03	35.22	Average	Live	46	-10.78
0.746447	24.7	9.86	0.03	34.6	Average	Live	46	-11.4
0.593128	25.7	9.85	0.03	35.58	Average	Live	46	-10.42
0.301449	25	9.83	0.03	34.86	Average	Live	50.2	-15.34
0.379978	22.29	9.84	0.03	32.15	Average	Live	48.28	-16.13
0.882938	23.89	9.87	0.03	33.79	Average	Live	46	-12.21
1.051214	23.74	9.87	0.03	33.64	Average	Live	46	-12.36
0.808148	24.09	9.87	0.03	33.99	Average	Live	46	-12.01

4.604589	22.64	9.92	0.03	32.58	Average	Live	46	-13.42
4.31291	20.41	9.91	0.03	30.36	Average	Live	46	-15.64
0.540776	18.7	9.84	0.03	28.58	Average	Live	46	-17.42
4.731731	20.28	9.92	0.03	30.23	Average	Live	46	-15.77
1.447599	22.59	9.88	0.03	32.5	Average	Live	46	-13.5
0.462246	21.31	9.84	0.03	31.18	Average	Live	46.65	-15.47
4.436313	20.19	9.91	0.03	30.14	Average	Live	46	-15.86
3.02279	19.46	9.9	0.03	29.39	Average	Live	46	-16.61
3.866042	18.03	9.91	0.03	27.97	Average	Live	46	-18.03
1.924383	18.51	9.88	0.03	28.42	Average	Live	46	-17.58
0.522078	23.89	9.84	0.03	33.76	Average	Live	46	-12.24
0.15	31.84	9.82	0.06	41.72	Average	Live	56	-14.28
0.22292	30.21	9.83	0.04	40.08	Average	Live	52.71	-12.63
0.522078	26.33	9.84	0.03	36.2	Average	Live	46	-9.8
0.22292	28.75	9.83	0.04	38.62	Average	Live	52.71	-14.09
0.15	31.47	9.82	0.06	41.35	Average	Live	56	-14.65

Neutral

Frequency MHz	Raw dBµV/m	Cable Loss	Ca Factor	Level dBµ/m	Detector	Line	Limit dBµV/m	Margin dB
0.593128	38.42	9.85	0.03	48.3	Quasi Peak	Neutral	56	-7.7
0.660439	37.5	9.86	0.03	47.39	Quasi Peak	Neutral	56	-8.61
0.955858	34.88	9.87	0.03	44.78	Quasi Peak	Neutral	56	-11.22
0.993253	33.25	9.87	0.03	43.15	Quasi Peak	Neutral	56	-12.85
0.454768	36.36	9.84	0.03	46.23	Quasi Peak	Neutral	56.79	-10.56
0.914723	33.84	9.87	0.03	43.74	Quasi Peak	Neutral	56	-12.26
0.750186	36.6	9.87	0.03	46.49	Quasi Peak	Neutral	56	-9.51
1.200794	32.78	9.87	0.03	42.68	Quasi Peak	Neutral	56	-13.32
0.376238	39.08	9.84	0.03	48.94	Quasi Peak	Neutral	58.36	-9.42
0.525818	37.21	9.84	0.03	47.08	Quasi Peak	Neutral	56	-8.92
1.305499	32.51	9.87	0.03	42.42	Quasi Peak	Neutral	56	-13.58
0.823106	36.18	9.87	0.03	46.08	Quasi Peak	Neutral	56	-9.92
1.337285	31.95	9.87	0.03	41.86	Quasi Peak	Neutral	56	-14.14
1.451339	31.55	9.88	0.03	41.46	Quasi Peak	Neutral	56	-14.54
0.29584	42.2	9.83	0.03	52.06	Quasi Peak	Neutral	60.36	-8.29
1.256886	32.57	9.87	0.03	42.47	Quasi Peak	Neutral	56	-13.53
1.653271	30	9.88	0.03	39.91	Quasi Peak	Neutral	56	-16.09

0.226659	41.74	9.83	0.04	51.61	Quasi Peak	Neutral	62.57	-10.96
0.613695	32.36	9.85	0.03	42.24	Quasi Peak	Neutral	56	-13.76
0.15	47.13	9.82	0.06	57.01	Quasi Peak	Neutral	66	-8.99
1.673838	30.77	9.88	0.03	40.67	Quasi Peak	Neutral	56	-15.33
0.593128	24.45	9.85	0.03	34.33	Average	Neutral	46	-11.67
0.660439	23.9	9.86	0.03	33.79	Average	Neutral	46	-12.21
0.955858	21.93	9.87	0.03	31.83	Average	Neutral	46	-14.17
0.993253	20.75	9.87	0.03	30.65	Average	Neutral	46	-15.35
0.454768	20.09	9.84	0.03	29.96	Average	Neutral	46.79	-16.83
0.914723	20.46	9.87	0.03	30.36	Average	Neutral	46	-15.64
0.750186	22.5	9.87	0.03	32.4	Average	Neutral	46	-13.6
1.200794	21.12	9.87	0.03	31.02	Average	Neutral	46	-14.98
0.376238	22.07	9.84	0.03	31.94	Average	Neutral	48.36	-16.42
0.525818	21.19	9.84	0.03	31.06	Average	Neutral	46	-14.94
1.305499	20.28	9.87	0.03	30.18	Average	Neutral	46	-15.82
0.823106	22.07	9.87	0.03	31.97	Average	Neutral	46	-14.03
1.337285	20.87	9.87	0.03	30.78	Average	Neutral	46	-15.22
1.451339	20	9.88	0.03	29.91	Average	Neutral	46	-16.09
0.29584	27.5	9.83	0.03	37.36	Average	Neutral	50.36	-13
1.256886	25.21	9.87	0.03	35.12	Average	Neutral	46	-10.88
1.653271	18.93	9.88	0.03	28.84	Average	Neutral	46	-17.16
0.226659	25.2	9.83	0.04	35.07	Average	Neutral	52.57	-17.51
0.613695	17.8	9.85	0.03	27.68	Average	Neutral	46	-18.32
0.15	32.14	9.82	0.06	42.02	Average	Neutral	56	-13.98
1.673838	20	9.88	0.03	29.91	Average	Neutral	46	-16.09

Appendix A

5 Test Plan

This test report is intended to follow this test plan outlined here in unless otherwise stated in this here report. The following test plan will give details on product information, standards to be used, test set ups and refer to TUV test procedures. The test procedures will give the steps to be taken when performing the stated test. The product information below came via client, product manual, product itself and or the internet.

5.1 General Information

Client	Vuzix Corporation
Address	25 Hendrex Rd
	West Henrietta, NY 14586

5.2 EUT Designation

Model Name	Blade
Model Number(s)	447

5.3 EUT Description

Smart Glasses

5.4 Equipment Under Test (EUT) Description

The Blade model 447 are smart glasses. The glasses contain radios which operate using the following technologies: 802.11 b/g/n (only 20 MHz modulation), Bluetooth BDR, EDR, and LE.

5.5 Product Environment(s)

☒	**Domestic/Residential**	☐	**Hospital**
☒	**Light Industrial/Commercial**	☐	**Small Clinic**
☐	**Industrial**	☐	**Doctor's office**
☐	**Telecommunications Center**	☐	**Other than Telecommunications Center**
☐	**Other**	**Motor Vehicle**	

5.6 Applicable Documents

Standards	Description
FCC Part 15 Subpart B:2018	Radiated Emissions
FCC Part 15 Subpart B:2018	Conducted Emissions

5.7 EUT Electrical Power Information

Name	# of Phases	Type	Input Voltage		AC Voltage Frequency	Current Max.	Power
			Min	Max			
USB	1 ☐ 3 ☐ None ☒	AC ☐ DC ☒ Host ☐ Batteries ☐	4.4	5.25	-- to -- Hz	-- A	--
Battery	1 ☐ 3 ☐ None ☒	AC ☐ DC ☐ Host ☐ Batteries ☒	3.3	4.2	NA	-- A	--
Notes	None						

5.8 EUT Clock/Oscillator Frequencies

Reference Designation	Speed (MHz)	Type
Block Diagram	26 MHz	☒ Oscillator ☐ Microprocessor
Block Diagram	32.768 kHz	☐ Oscillator ☒ Microprocessor
Block Diagram	24.576 MHz	☐ Oscillator ☒ Microprocessor

5.8.1 Radiated Emissions, Upper Frequency

☐	**Less than 108 MHz**	**Scan to 1 GHz**
☐	**Less than 500 MHz**	**Scan to 2 GHz**
☐	**Less than 1000 MHz**	**Scan to 5 GHz**
☒	**Greater than 1000 MHz**	**Scan to 5th Harmonic or 40 GHz (whichever is lower)**

5.9 Electrical Support Equipment

Reference Designation	Manufacturer	Model	Serial Number	BSMI #
N/A				

5.10 Non - Electrical Support Equipment

Reference Designation	Manufacturer	Model	Serial Number or Description (e.g., Type of Gas or Liquid)
N/A	--	--	--

5.11 EUT Equipment/Cabling Information

EUT Port	Connected To	Cable Type				
		Length (Meters)	Shielded Yes / No		Bead Yes / No	
USB Power	AC power block	< 3	☐	☒	☐	☒

5.12 EUT Test Program

An FCC test app is active on the smart glasses. The app exercises all unintentional radiator functions including camera, microphone, speaker, and sensors.

5.13 EUT Modes of Operation

All intentional radiators in idle mode and FCC test app running.

5.14 EUT Configuration

5.14.1 Description

Configuration	Description
1	All radios in idle mode and FCC test app running
Notes None.	

5.15 Emissions

5.15.1 Radiated Emissions

5.15.1.1 Final Radiated Emissions Test Setup

Standard	FCC Part 15 Subpart B:2018			**TUV Test Procedure**	MS-0005192
Limit	Class B	**Emissions Verification**		Emissions Under Limit	
Frequency Range	30MHz - 12.75GHz				
Scan #1	30 – 1000 MHz	**Antenna Distance**	3 m	**Detector**	Quasi Peak
Scan #2	1 – 12.75 GHz	**Antenna Distance**	3 m	**Detector**	Peak and Average
Configuration	See Section 5.14				
Notes	None				

5.15.2 Conducted Emissions – N/A

5.15.2.1 Final Conducted Emissions Test Setup

Standard	FCC Part 15 Subpart B:2018	**TUV Test Procedure**	MS-0005180
Limit(s)	Class B: Quasi Peak Average	**Emissions Verification**	Emissions Under Limit
AC Mains Line	1 AC Line	**LAN Cable(s)**	NA
Frequency Range	Class B 150 kHz - 30 MHz	**Detectors**	Quasi Peak Average
Scan #1	110 Vac, 60 Hz	**EUT Powered By**	See Section 5.7
Configuration	See Section 5.14.1		