


RF Test Report

Applicant : Verkada Inc

Product Name : Door Reader

Trade Name :  Verkada

Model Number : AD34-HW

Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013

Received Date : Feb. 05, 2024

Test Period : Mar. 14, 2024 ~ Mar. 15, 2024

Issued Date : Jun. 19, 2024

Issued by

Eurofins E&E Wireless Taiwan Co., Ltd.
No. 140-1, Changan Street, Bade District,
Taoyuan City 334025, Taiwan (R.O.C.)
Tel : +886-3-2710188 / Fax : +886-3-2710190



Taiwan Accreditation Foundation accreditation number: 1330
Frequency Range: 9 kHz to 325 GHz
Bade test site :
Test Firm Registration Number: 226252
Test Firm Designation Number: TW0010
Wugu test site :
Test Firm Registration Number: 191812
Test Firm Designation Number: TW0034

Note:

- 1.The test results are valid only for samples provided by customers and under the test conditions described in this report.
- 2.This report shall not be reproduced except in full, without the written approval of Eurofins E&E Wireless Taiwan Co., Ltd.
- 3.The relevant information is provided by customers in this test report. According to the correctness, appropriateness or completeness of the information provided by the customer, if there is any doubt or error in the information which affects the validity of the test results, the laboratory does not take the responsibility.

Revision History

Rev.	Issued Date	Description	Revised by
00	Jun. 19, 2024	Initial Issue	Snow Wang

Verification of Compliance

Applicant : Verkada Inc

Product Name : Door Reader

Trade Name :  Verkada

Model Number : AD34-HW

FCC ID : 2AWUU6074001

Applicable Standard : FCC 47 CFR PART 15 SUBPART C
ANSI C63.10:2013

Test Result : Complied

Performing Lab. : Eurofins E&E Wireless Taiwan Co., Ltd.
No. 140-1, Changan Street, Bade District,
Taoyuan City 334025, Taiwan (R.O.C.)
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Taiwan Accreditation Foundation accreditation number: 1330



Eurofins E&E Wireless Taiwan Co., Ltd. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by Eurofins E&E Wireless Taiwan Co., Ltd. based on interpretations and/or observations of test results. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Approved By : _____

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Appendix A. Test Setup Photographs

1 General Information

1.1. Summary of Test Result

Standard	Item	Results	Remark
15.203	Antenna Requirement	Meet Require	---
15.207(a)	Conducted Emissions Voltage	PASS	---
15.205 (a) 15.209 (a)	Radiated Emission Limits	PASS	---

Decision Rule

- Uncertainty is not included.
- Uncertainty is included.

Standard	Description
CFR47, Part 15, Subpart C	Intentional Radiators
ANSI C63. 10: 2013	American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices

1.2. Testing Location

Lab Name: Eurofins E&E Wireless Taiwan Co., Ltd.

Site Address: No. 140-1, Changan Street, Bade District, Taoyuan City 334025, Taiwan (R.O.C.)

Site Address: No. 2, Wuquan 5th Rd. Wugu Dist., New Taipei City, Taiwan (R.O.C.)

1.3. Measurement Uncertainty

Test Item	Frequency	Uncertainty			
		BD		WG	
Conducted Emission	150 kHz ~ 30 MHz	2.7 dB		2.6 dB	
Test Item	Frequency	Uncertainty			
		96601-BD	96603-BD	96602-WG	96603-WG
Radiated Emission	9 kHz ~ 30 MHz	1.9 dB	1.9 dB	1.6 dB	1.6 dB
	30 MHz ~ 1000 MHz	4.9 dB	4.9 dB	4.8 dB	4.8 dB
	1000 MHz ~ 18000 MHz	4.9 dB	5.0 dB	5.0 dB	5.2 dB
	18000 MHz ~ 26500 MHz	4.3 dB	4.4 dB	4.4 dB	4.5 dB
	26500 MHz ~ 40000 MHz	4.5 dB	4.5 dB	4.6 dB	4.5 dB


1.4. Test Site Environment

Items	Required (IEC 60068-1)	Interval(*)
Temperature (°C)	15-35	20-30
Humidity (%RH)	25-75	45-75

(*)The measurement ambient temperature is within this range.

2 EUT Description

The product specifications of the EUT presented in the report are declared by the manufacturer who shall take full responsibility for the authenticity

Applicant	Verkada Inc 405 E. 4th Ave. San Mateo California 94401 United States
Product Name	Door Reader
Trade Name	 Verkada
Model Number	AD34-HW
FCC ID	2AWUU6074001
Frequency Range	125 kHz
Modulation Type	FSK
Number of Channels	1 Channel
Antenna Type	Coil Antenna
Operate Temp. Range	-40 ~ +65 °C
EUT Power Rating	DC 12 V, 250 mA

Note : All measurements were performed radiated and therefore additional antenna gain is not required.

3 Test Methodology

3.1. Mode of Operation

The following test mode(s) were scanned during the preliminary test :

Test Mode
Transmit Mode

After verification, all tests were carried out with the worst case test modes.

Eurofins has verified the construction and function in typical operation. All the test modes were carried out with the EUT in normal operation.

By preliminary testing and verifying three axis (X, Y and Z) position of EUT transmitted status, it was found that “X axis” position was the worst, then the final test was executed the worst condition and test data were recorded in this report.

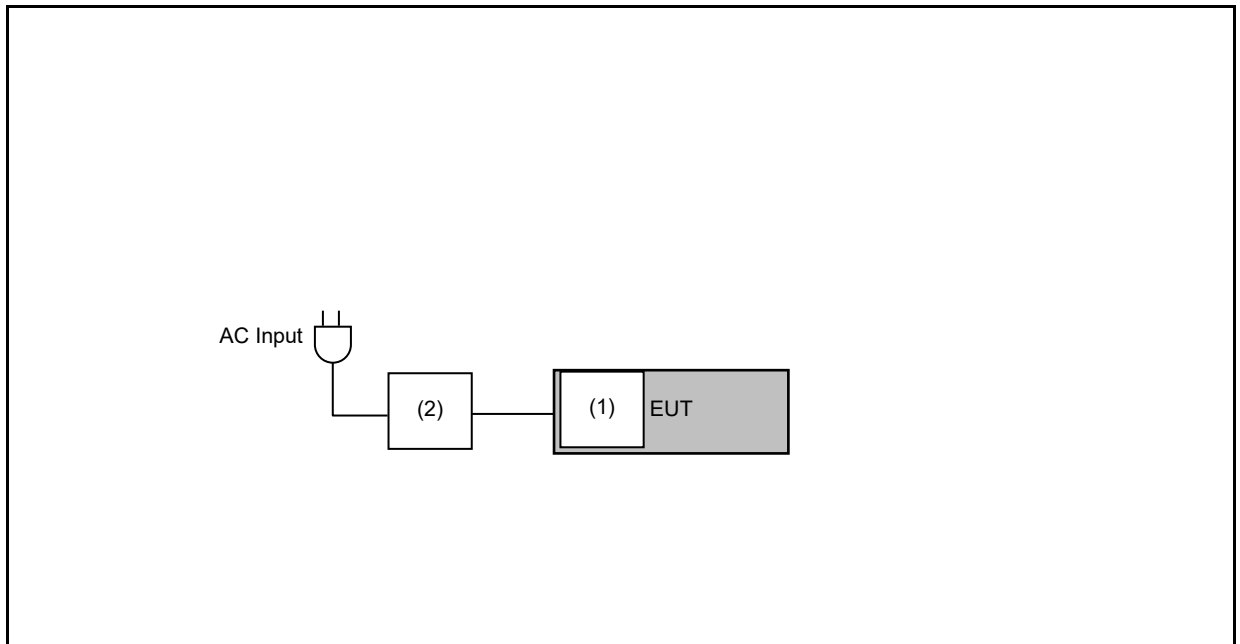
Test Mode	Frequency (kHz)	Test Software Version
Transmit Mode	125	Engineering Mode

3.2. EUT Test Step

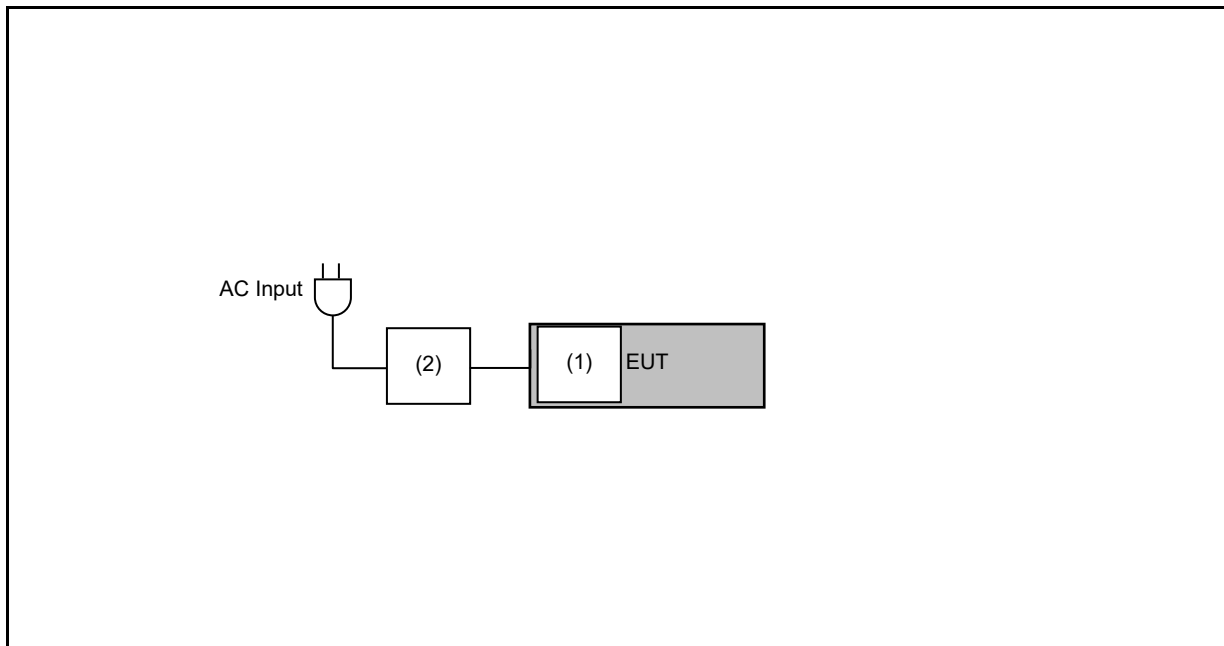
1.	Setup the EUT shown on “Configuration of Test System Details.”
2.	Turn on the power of all equipment.
3.	The EUT will start to operate function.

3.3. Configuration of Test System Details

Radiated Emissions



Conduction Emissions



	Product	Manufacturer	Model Number	Serial Number	Power Cord
(1)	RFID Card	KEYSCAN	ISOPROX	119-6026711102127063-3	---
(2)	Power Supply	RIGOL	DP711	DP7A243601513	---

3.4. Test Instruments

For Radiated Emissions
 Test Period: Mar. 14 ~ Mar. 15, 2024
 Testing Engineer: Jason Yeh

Radiation test sites		Semi Anechoic Room 96603-WG				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
<input checked="" type="checkbox"/>	LOOP Antenna (9 kHz~30 MHz)	Schwarzbeck Mess-Elektronik	FMZB 1513-60	00031	Feb. 23, 2024	1 year
<input checked="" type="checkbox"/>	Trilog Broadband Antenna (30 kHz~1 GHz)	Schwarzbeck Mess-Elektronik	VULB9168	1276	Feb. 02, 2024	1 year
<input checked="" type="checkbox"/>	Spectrum Analyzer (2 Hz~50 GHz)	KEYSIGHT	N9030B	MY57153537	Apr. 18, 2023	1 year
<input checked="" type="checkbox"/>	Pre-Amplifier	EMCI	EMC001330	980859	Nov. 29, 2023	1 year
<input checked="" type="checkbox"/>	Coaxial Cable (10 kHz~3000 MHz)	EMCI	EMCCFD400-NM-NM-2000	211009	Dec. 28, 2023	1 year
<input checked="" type="checkbox"/>	Coaxial Cable (10 kHz~3000 MHz)	EMCI	EMCCFD400-NM-NM-2000	211010	Dec. 28, 2023	1 year
<input checked="" type="checkbox"/>	Coaxial Cable (10 kHz~3000 MHz)	EMCI	EMCCFD400-NM-NM-6000	211018	Dec. 28, 2023	1 year
<input checked="" type="checkbox"/>	Software	R_RAM	V1.3	N/A	N.C.R.	---

Note: N.C.R. = No Calibration Request

For Conduction Emissions
 Test Period: Mar. 15, 2024
 Testing Engineer: Jason Yeh

Radiation test sites		Conducted Emission Measurement Conduction01-WG				
Use	Equipment	Manufacturer	Model Number	Serial Number	Cal. Date	Cal. Period
<input checked="" type="checkbox"/>	Test Receiver	R&S	ESR3	102919	Dec. 30, 2023	1 year
<input checked="" type="checkbox"/>	LISN	R&S	ENV216	101041	Apr. 12, 2023	1 year
<input checked="" type="checkbox"/>	Current Probe	R&S	EZ-17	101687	Jun. 15, 2023	1 year
<input checked="" type="checkbox"/>	Cable	EMCI	EMCCFD300-BM-NM-4000	220402	Jun. 08, 2023	1 year
<input checked="" type="checkbox"/>	Software	ELEKTRA	94.50.4	N.A.	N.C.R.	N.C.R.

Note: N.C.R. = No Calibration Request

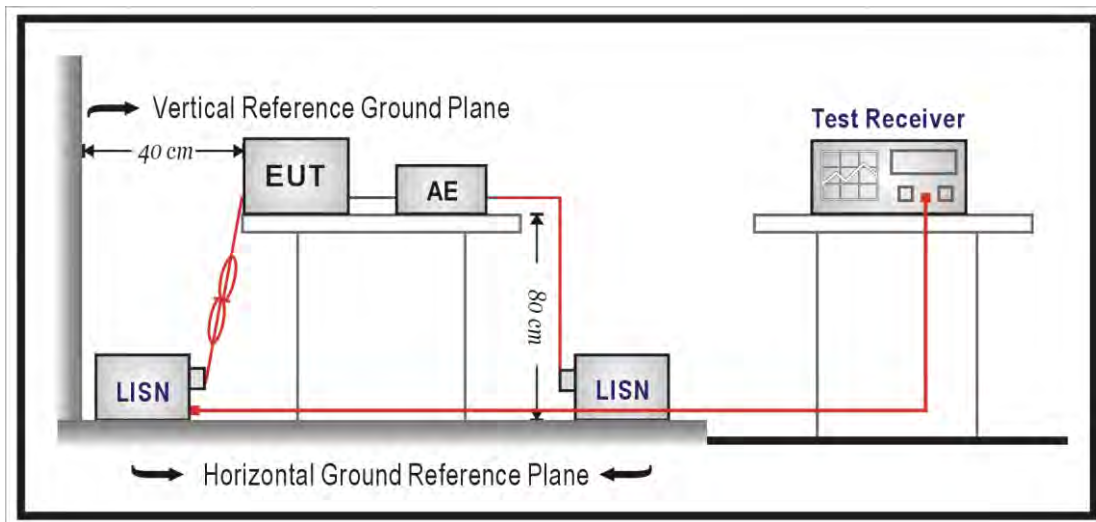
4 Measurement Procedure

4.1. AC Power Line Conducted Emission Measurement

■ Limit

Frequency (MHz)	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.50 - 5.0	56	46
5.0 - 30.0	60	50

■ Test Setup



■ Test Procedure

The EUT and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a $50 \Omega // 50 \mu\text{H}$ coupling impedance for the measuring equipment. The peripheral devices are also connected to the main power through a LISN that provides a $50 \Omega // 50 \mu\text{H}$ coupling impedance with 50 ohm termination.

Tabletop device shall be placed on a non-conducting platform, of nominal size 1 m by 1.5 m, raised 80 cm above the reference ground plane. The wall of screened room shall be located 40 cm to the rear of the EUT. Other surfaces of tabletop or floor standing EUT shall be at least 80 cm from any other ground conducting surface including one or more LISNs. For floor-standing device shall be placed under the EUT with a 12 mm insulating material.

Conducted emissions were investigated over the frequency range from 0.15 MHz to 30 MHz using a resolution bandwidth of 9 kHz. The equipment under test (EUT) shall be meet the limits in section 4.1, as applicable, including the average limit and the quasi-peak limit when using respectively, an average detector and quasi-peak detector measured in accordance with the methods described of related standard. When all of peak value were complied with quasi-peak and average limit from 150 kHz to 30 MHz then quasi-peak and average measurement was unnecessary.

The AMN shall be placed 0.8 m from the boundary of the unit under test and bonded to a ground reference plane for AMNs mounted on top of the ground reference plane. This distance is between the closest points of the AMN and the EUT. All other units of the EUT and associated equipment shall be at least 0.8 m from the AMN. If the mains power cable is longer than 1 m then the cable shall be folded back and forth at the centre of the lead to form a bundle no longer than 0.4 m. All of interconnecting cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle 30 cm to 40 cm long. All of EUT and AE shall be separate place more than 0.1 m. All 50 Ω ports of the LISN shall be resistively terminated into 50 Ω loads when not connected to the measuring instrument.

If the reading of the measuring receiver shows fluctuations close to the limit, the reading shall be observed for at least 15 s at each measurement frequency; the higher reading shall be recorded with the exception of any brief isolated high reading which shall be ignored.

4.2. Radiated Emission Measurement

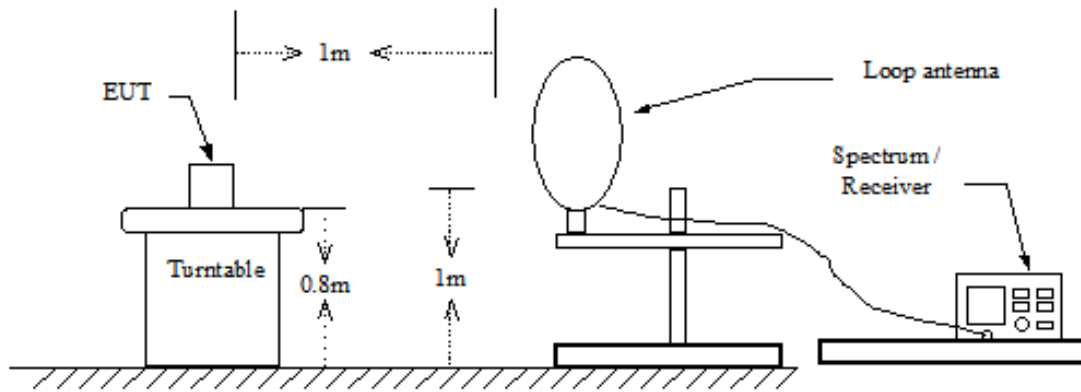
■ Limit

According to §15.209(a), except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

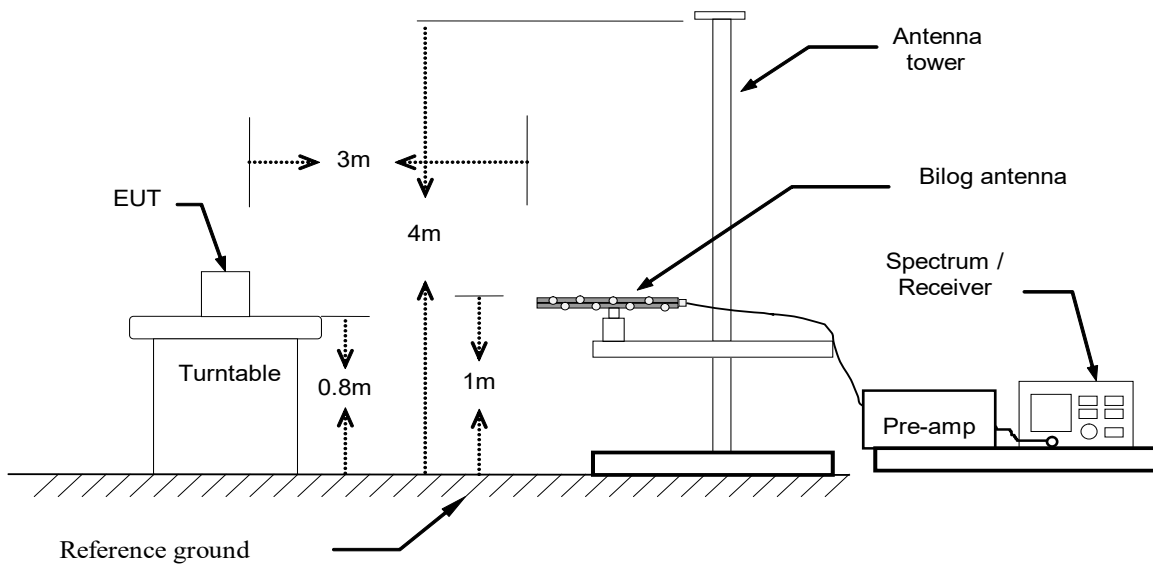
Frequency (MHz)	Field Strength (μ V/m at meter)	Measurement Distance (meter)
0.009 – 0.490	2400 / F (kHz)	300
0.490 – 1.705	24000 / F (kHz)	30
1.705 – 30.0	30	30
30 - 88	100**	3
88-216	150**	3
216-960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

■ Setup
 9 kHz ~ 30 MHz



30 MHz ~ 1 GHz



■ Test Procedure

Final radiation measurements were made on a three-meter Semi Anechoic Chamber. The EUT system was placed on a nonconductive turntable which is 0.8 meters height, top surface 1.0 x 1.5 meter. The spectrum was examined from 3 Hz to 44 GHz in order to cover the whole spectrum below 10th harmonic which could generate from the EUT. During the test, EUT was set to transmit continuously.

For measurements below 30 MHz the resolution bandwidth is set to 10 kHz for peak detection measurements or 9 kHz for quasi-peak detection measurements. The video bandwidth is 3 times of the resolution bandwidth.

For measurements below 1 GHz the resolution bandwidth is set to 100 kHz for peak detection measurements or 120 kHz for quasi-peak detection measurements. Peak detection is used unless otherwise noted as quasi-peak.

For measurements above 1 GHz the resolution bandwidth is set to 1 MHz, and then the video bandwidth is set to 3 MHz for peak measurements and 10 Hz for average measurements.

A nonconductive material surrounded the EUT to supporting the EUT for standing on three orthogonal planes. At each condition, the EUT was rotated 360 degrees, and the antenna was raised and lowered from one to four meters to find the maximum emission levels. Measurements were taken using both horizontal and vertical antenna polarization.

Broadband/Horn Antenna were used in frequency 30 MHz to 18 GHz at a distance of 3 meter. Loop/Horn Antenna was used in frequency 9 kHz to 30 MHz and 18 to 26.5 GHz at a distance of 1 meter. All test results were extrapolated to equivalent signal at 3 meters utilizing an inverse linear distance extrapolation Factor (20 dB/decade).

For testing above 1 GHz, the emission level of the EUT in peak mode was 20 dB lower than average limit (that means the emission level in peak mode also complies with the limit in average mode), then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be measured in average mode again and reported.

Appropriate preamplifiers were used for improving sensitivity and precautions were taken to avoid overloading or desensitizing the spectrum analyzer. No post – detector video filters were used in the test.

The spectrum analyzer's 6 dB bandwidth was set to 1 MHz, and the analyzer was operated in the peak detection mode, for frequencies both below and up 1 GHz. The average levels were obtained by subtracting the duty cycle correction factor from the peak readings.

The following procedures were used to convert the emission levels measured in decibels referenced to 1 microvolt (dBuV) into field intensity in microvolt pre-meter (uV/m).

The actual field intensity in decibels referenced to 1 microvolt in to field intensity in microvolt per-meter (dBuV/m).

The actual field intensity in referenced to 1 microvolt per meter (dBuV/m) is determined by algebraically adding the measured reading in dBuV, the antenna factor (dB), and cable loss (dB) and Subtracting the gain of preamplifier (dB) is auto calculate in spectrum analyzer.

$$(1) \text{ Amplitude (dBuV/m) = FI (dBuV) +AF (dBuV) +CL (dBuV)-Gain (dB)}$$

FI= Reading of the field intensity.

AF= Antenna factor.

CL= Cable loss.

P.S Amplitude is auto calculate in spectrum analyzer.

$$(2) \text{ Actual Amplitude (dBuV/m) = Amplitude (dBuV)-Dis(dB)}$$

The FCC specified emission limits were calculated according the EUT operating frequency and by following linear interpolation equations:

(a) For fundamental frequency : Transmitter Output < +30 dBm

(b) For spurious frequency : Spurious emission limits = fundamental emission limit /10

Data of measurement within this frequency range without mark in the table above means the reading of emissions are attenuated more than 20 dB below the permissible limits or the field strength is too small to be measured.

4.3. Antenna Requirement

- **Require**

An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

- **Antenna Connector Construction**

See section 2 – antenna information.

5 Test Results

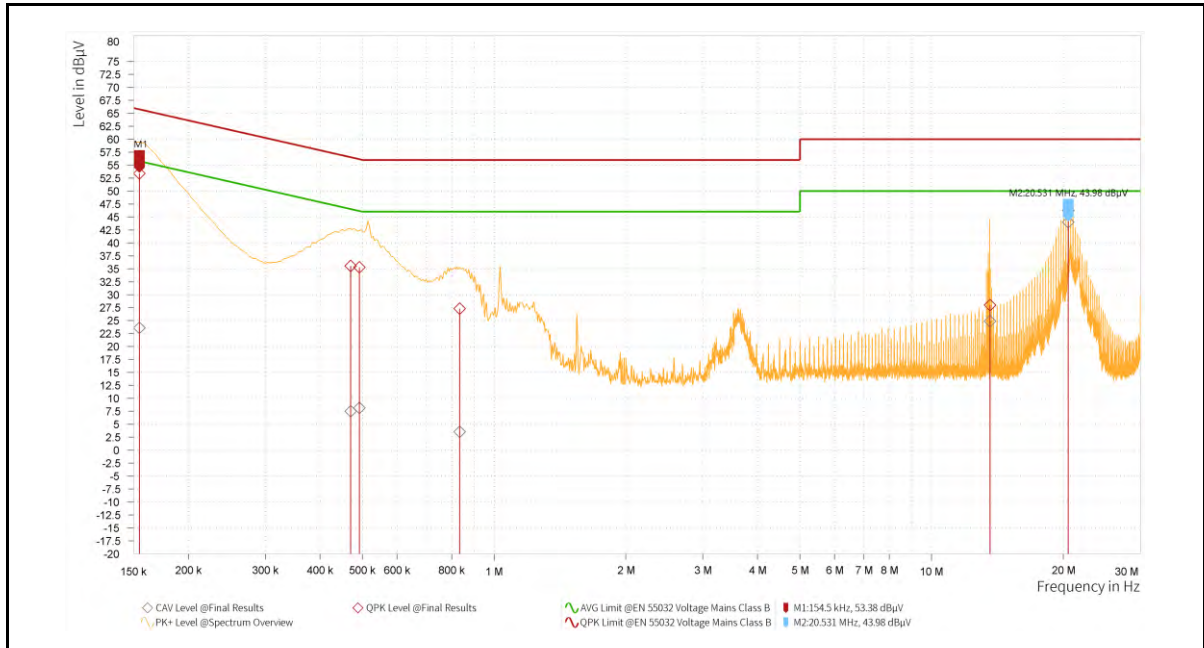
5.1. Conducted Emission

Standard:	FCC Part 15C	Line:	L1
Test item:	Conducted Emission	Power:	AC 120 V/60 Hz
Mode:	Transmit Mode		
Description:			



Rg	Frequency [MHz]	QP Result [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Result [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Correction factor [dB]	Line
1	0.155	53.26	65.75	12.49	23.42	55.75	32.33	9.65	L1
1	0.452	34.56	56.85	22.29	6.73	46.85	40.12	9.65	L1
1	0.519	35.06	56.00	20.94	24.38	46.00	21.62	9.65	L1
1	0.830	28.06	56.00	27.94	4.36	46.00	41.64	9.67	L1
1	13.524	26.71	60.00	33.29	3.93	50.00	46.07	9.99	L1
1	20.792	48.34	60.00	11.66	45.58	50.00	4.42	10.10	L1

Standard:	FCC Part 15C	Line:	N
Test item:	Conducted Emission	Power:	AC 120 V/60 Hz
Mode:	Transmit Mode		
Description:			



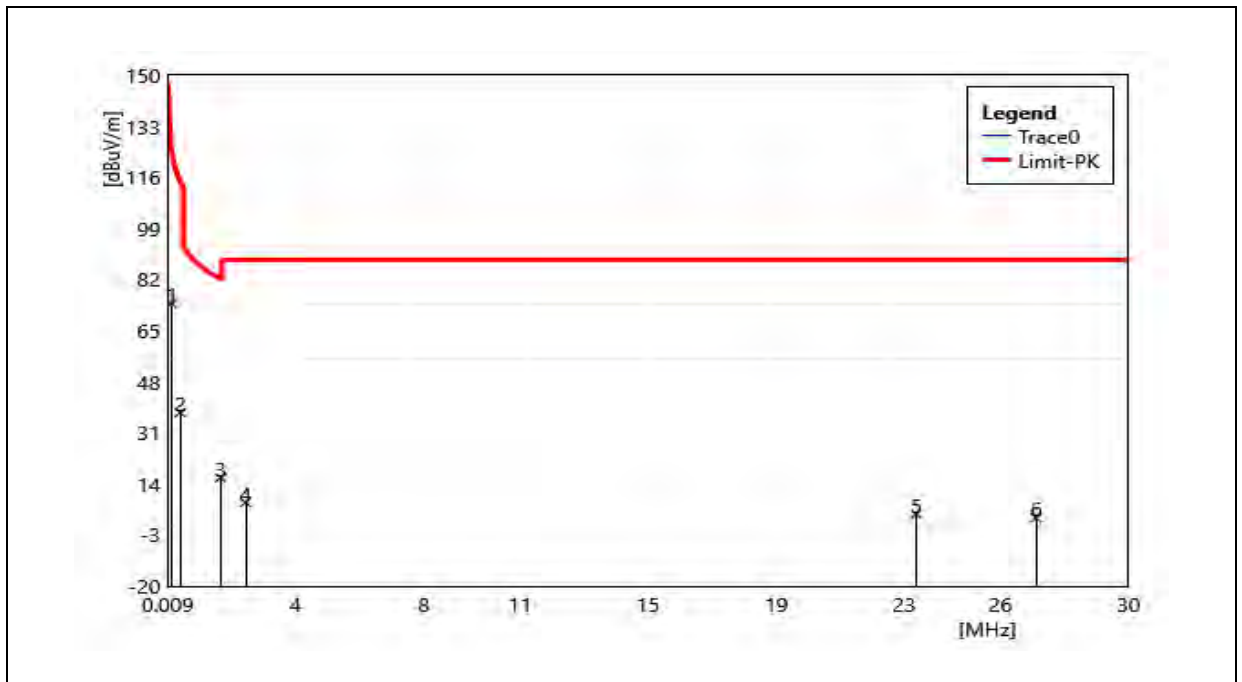
Rg	Frequency [MHz]	QP Result [dBµV]	QP Limit [dBµV]	QP Margin [dB]	AV Result [dBµV]	AV Limit [dBµV]	AV Margin [dB]	Correction factor [dB]	Line
1	0.155	53.38	65.75	12.37	23.60	55.75	32.16	9.64	N
1	0.470	35.53	56.52	20.99	7.52	46.52	39.00	9.65	N
1	0.492	35.26	56.13	20.87	8.17	46.13	37.96	9.65	N
1	0.834	27.30	56.00	28.70	3.55	46.00	42.45	9.67	N
1	13.601	27.99	60.00	32.01	24.91	50.00	25.09	10.07	N
1	20.531	46.22	60.00	13.78	43.98	50.00	6.02	10.22	N

5.2. Radiated Emission Measurement

Harmonic

9 kHz ~ 30 MHz:

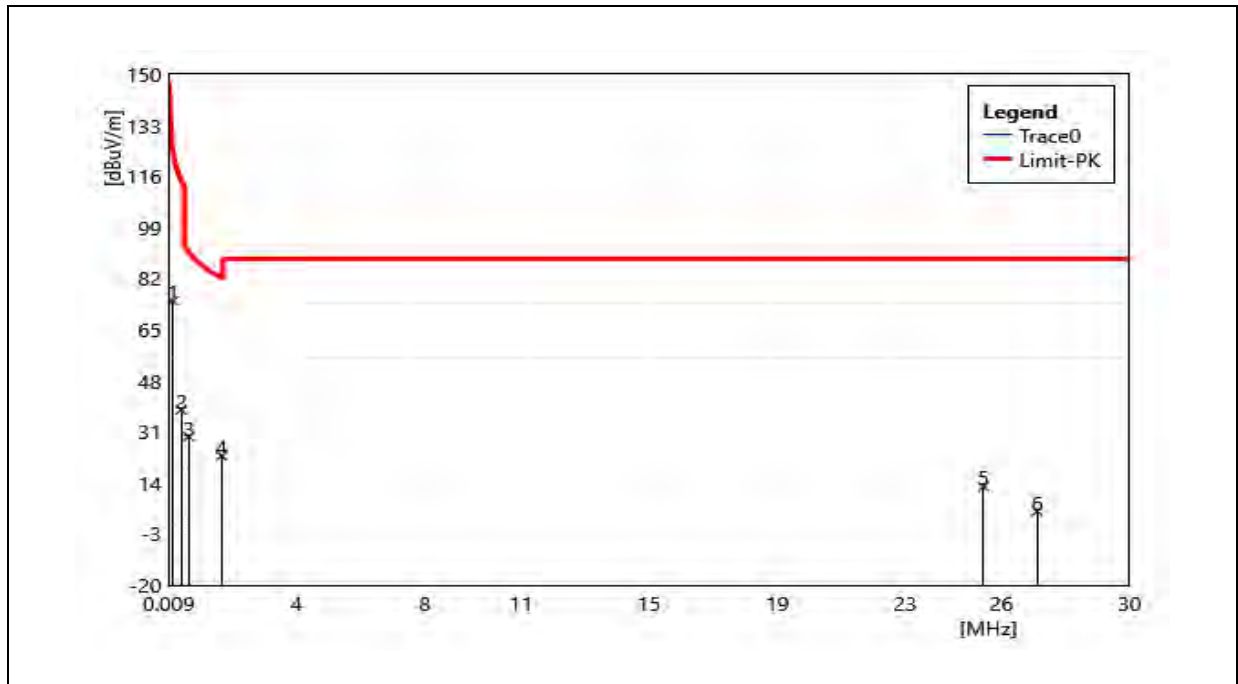
Standard:	FCC Part 15C	Test Distance:	300/30 m
Test item:	Harmonic		
Mode:	Transmit Mode		
Ant.Polar.:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.129	86.59	-12.53	74.06	-26.85	25.39	-52.24	QP
2	0.4	49.29	-11.48	37.81	-53.27	15.56	-68.83	QP
3	1.66	27.18	-11.13	16.06	-42.66	23.20	-65.86	QP
4	2.44	19.07	-11.23	7.84	-47.53	29.54	-77.08	QP
5	23.37	13.69	-9.62	4.07	-31.67	29.54	-61.21	QP
6	27.12	11.68	-8.95	2.73	-31.72	29.54	-61.27	QP

Note: The level is measured at 1 meter and is converted into result at 300 or 30 meter.

Standard:	FCC Part 15C	Test Distance:	300/30 m
Test item:	Harmonic		
Mode:	Transmit Mode		
Ant.Polar.:	Vertical		

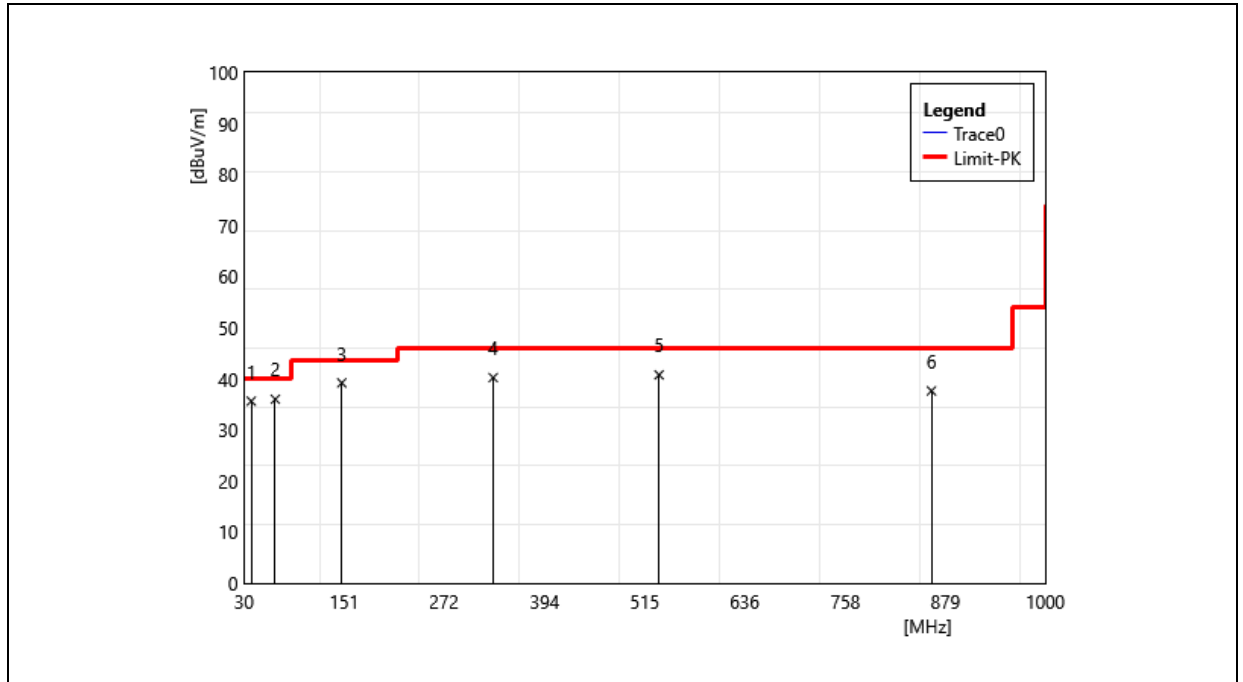


No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.129	87.11	-12.53	74.58	-26.33	25.39	-51.72	QP
2	0.4	49.84	-11.48	38.36	-52.72	15.56	-68.28	QP
3	0.64	40.68	-11.27	29.41	-37.59	31.48	-69.07	QP
4	1.66	34.18	-11.13	23.05	-35.67	23.20	-58.87	QP
5	25.44	21.54	-8.77	12.77	-22.26	29.54	-51.80	QP
6	27.12	13.58	-8.95	4.63	-29.82	29.54	-59.37	QP

Note: The level is measured at 1 meter and is converted into result at 300 or 30 meter.

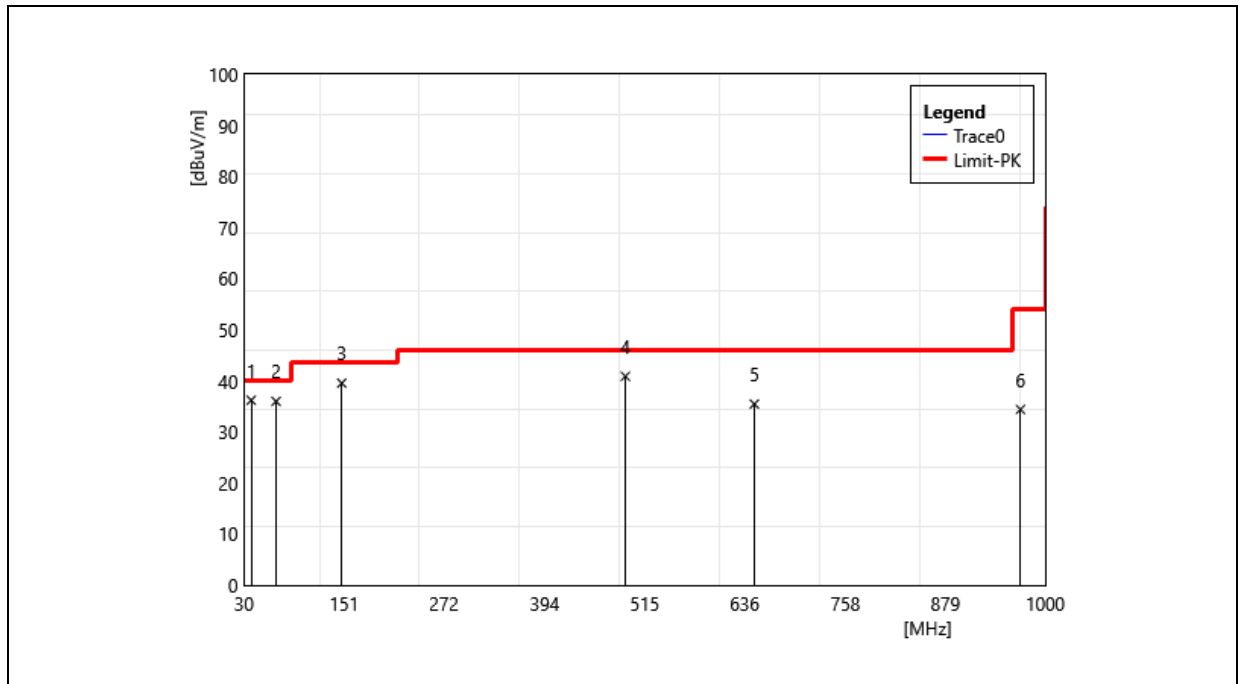
30 MHz ~ 1 GHz:

Standard:	FCC Part 15C	Test Distance:	3 m
Test item:	Harmonic		
Mode:	Transmit Mode		
Ant.Polar.:	Horizontal		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	38.73	38.03	-2.38	35.65	40.00	-4.35	QP
2	67.83	16.67	19.35	36.02	40.00	-3.98	QP
3	148.34	-40.20	79.41	39.21	43.50	-4.29	QP
4	331.67	-176.44	216.70	40.26	46.00	-5.74	QP
5	532.46	47.33	-6.55	40.79	46.00	-5.22	QP
6	862.26	39.13	-1.48	37.65	46.00	-8.35	QP

Standard:	FCC Part 15C	Test Distance:	3 m
Test item:	Harmonic		
Mode:	Transmit Mode		
Ant.Polar.:	Vertical		



No.	Frequency (MHz)	Reading (dBuV)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	38.73	38.59	-2.38	36.21	40.00	-3.79	QP
2	68.80	15.88	20.11	35.99	40.00	-4.01	QP
3	148.34	-39.85	79.41	39.56	43.50	-3.94	QP
4	491.72	48.05	-7.14	40.91	46.00	-5.09	QP
5	647.89	39.40	-3.93	35.47	46.00	-10.53	QP
6	969.93	34.52	-0.11	34.41	54.00	-19.60	QP

---END---