FCC Test Report

Report No: WD-RF-R-190612-A0

Product Name	:	Ethernet Data Terminal
Model Name	:	FAT820WMF
Series Model Name	:	FAT820xxx-xx (x = 0~9, A~Z)
FCC ID	:	WXAFAT820WMF
Applicant	:	GIGA-TMS INC.
Received Date	:	Jul. 15, 2019
Tested Date	:	Aug. 20, 2019 ~ Sep. 12, 2019
Applicable Standard	:	47 CFR FCC Part 15, Subpart C (Section 15.225) ANSI C63.10 : 2013

Wendell Industrial Co., Ltd
Wendell Electrical Testing Lab.

Test Report

Issued Date: September 12, 2019
Project No.: 19Q071501

Product Name	Ethernet Data Terminal
Trade Name	PROMAG, GIGATEK, ProxData
Model Name	FAT820WMF
Series Model Name	FAT820xxx-xx (x = 0~9, A~Z)
FCC ID	WXAFAT820WMF
Applicant	GIGA-TMS INC.
Manufacturer	GIGATEK INC.
EUT Rated Voltage	AC 100 ~ 240V / 50 or 60Hz
EUT Test Voltage	AC 120V / 60Hz
EUT Supports Radios Application	WLAN 802.11b/g WLAN 802.11n (HT20) RFID 13.56 MHz
Applicable Standard	47 CFR FCC Part 15, Subpart C (Section 15.225) ANSI C63.10 : 2013
Test Result	Complied

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Approved : Gary Wu
(Project Manager / Gary Wu)

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Document Revision History

Report No.	Issue date	Description
WD-RF-R-190612-A0	September 12, 2019	Initial report

Summary of Test Result

Ref. Std. Clause	Test Items	Result
15.203	Antenna Requirement	Pass
15.215(c)	20dB Spectrum Bandwidth	Pass
15.225(e)	Frequency Stability	Pass
15.225 (a)(b)(c)	Field Strength of Fundamental Emissions	Pass
15.225(d)	Radiated Spurious Emissions	Pass
15.207	AC Conducted Emission	Pass

1 Generation Information

1.1 Applicant

GIGA-TMS INC.
8F. NO31, Lane 169, Kang-Ning St., His-Chih, New Taipei City 22180, Taiwan

1.2 Manufacturer

GIGATEK INC.
NO.47, Hsiang Ho Road, Tantzu Dist., Taichung City 42741, Taiwan R.O.C.

1.3 Description of Equipment under Test

Product Name	Ethernet Data Terminal
Model No.	FAT820WMF
FCC ID	WXAFAT820WMF
Frequency Range	13.56 MHz
Type of Modulation	ASK
Antenna Information	Loop Antenna
EUT Supports Radios Application	WLAN 802.11b/g WLAN 802.11n (HT20) RFID 13.56 MHz
EUT Rated Voltage	AC 100 ~ 240V / 50 or 60Hz
EUT Test Voltage	AC 120V / 60Hz

Channel List

Channel	Frequency (MHz)
01	13.56

Test Frequencies in each operating band

Frequency range over which the device operates in each operating band (Note 1)	Number of test frequencies required	Location of test frequencies inside the operating frequency range (Note 1,2)
≤ 1 MHz	1	near centre
> 1 MHz and ≤ 10 MHz	2	1 near high end, 1 near low end
> 10 MHz	3	1 near high end, 1 near centre, and 1 near low end

Note 1: The frequency range over which the device operates in a given operating band is the difference between the highest and lowest frequencies on which the device can be tuned within that given operating band. The frequency range can be smaller than or equal to the operating band, but cannot be greater than the operating band.

Note 2: In the third column of table 1, "near" means as close as possible to or at the centre / low end / high end of the frequency range over which the device operates.

Firmware / Software Version

1	**Product Name**	Ethernet Data Terminal
2	**Model No.**	FAT820WMF
3	**Test SW Version**	N/A
4	**RF power setting in TEST SW**	☐ RF power setting was not able to alter during testing. ☒ RF power setting was able to alter during testing. (See the following table)

Parameters of test software setting

Type of Modulation	Channel	Frequency (MHz)	Set Value
ASK	01	13.56	Default

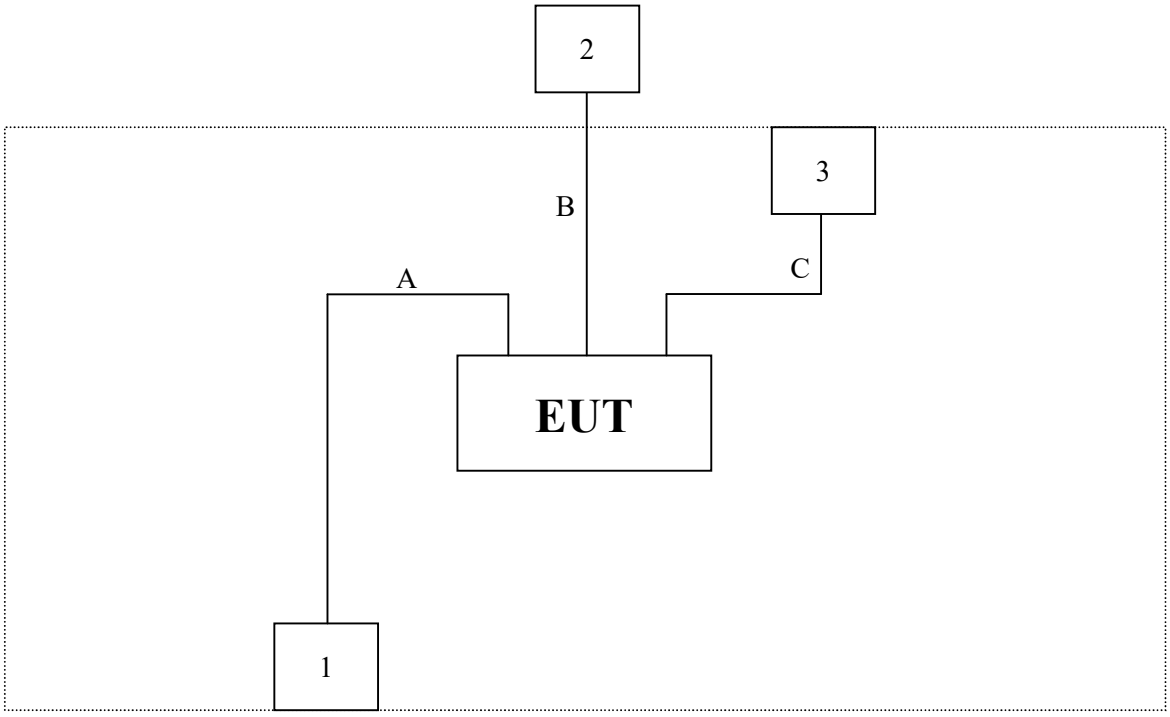
Test Mode

Mode 1	Transmit RFID

Note:

1. This device is a Ethernet Data Terminal with a built-in Wi-Fi and RFID transceiver.
2. Wi-Fi transceiver module FCC ID: 2AC7Z-ESPWROOM02
3. FAT820xxx-xx(x = 0~9, A~Z) series model difference：
   The first x is a Wi-Fi module.
   The second and third x are Card Reader.
   The fourth and fifth x are Firmware, Case and Label difference.
4. These tests were performed on a sample of equipment to demonstrate compliance with 47 CFR FCC Part 15, Subpart C (Section 15.225).
5. The radiation measurements are performed in X, Y, Z axis positioning. Only the X axis worst case is shown in the report.

1.4 Configuration of Tested System



Test Table

1.5 EUT Exercise Software

1. Setup the EUT as shown in Section 1.4
2. Turn on the power of all equipment.
3. Using tag to trigger RFID continuous transmission.
4. Verify that the EUT works properly.

1.6 Tested System Details

The types for all equipment, plus descriptions of all cables used in the tested system (including inserted cards) are:

No.	Product	Manufacturer	Model No.	Serial No.	Power Cord
1	USB Keyboard	Lemel	5105U	G6450015686	Non-shielded, Non-Core, 1.5m
2	Notebook PC	acer	N16Q1	NXVD4TA023742254707600	Non-shielded, 1 Core, 0.8m
3	Adapter	Asian Power Devices Inc.	WA-12M12FU	N/A	Non-shielded, Non-Core, 1.8m

No.	Signal Cable Type	Signal cable Description
A	USB Cable	Non-shielded, Non-Core, 1.5m
B	LAN Cable	Non-shielded, Non-Core, 6m
C	Power Cable	Non-shielded, Non-Core, 1.8m

1.7 Test Facility

Items	Required (IEC 60068-1)	Actual
Temperature (°C)	15-35	25
Humidity (% RH)	25-75	65
Barometric pressure (mbar)	860-1060	1001

Description: Accredited by TAF
Accredited Number: 2965

Issued by: Wendell Industrial Co., Ltd

Lab Address: 6F/6F-1, No.188, Baoqiao Rd., Xindian Dist.,
New Taipei City 23145, Taiwan R.O.C

Test Lab: Wendell Electrical Testing Lab.

Test Location: No.67-9, Shimen Rd., Tucheng Dist.,
New Taipei City 236, Taiwan R.O.C

FCC Accreditation Number: TW2965

FCC Designation Number: TW1118

1.8 Measurement Uncertainty

ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report. The measurement uncertainties given below are based on a 95% confidence (level based on a coverage factor K=2)

Measurement Project	Measuring Range	Expended Uncertainty
AC Conducted Emission	0.150 ~ 30 MHz	2.9 dB
Radiated Emission	0.009 ~ 30 MHz	3.8 dB
	30 ~ 1000 MHz	3.5 dB
DC Power Supply	0.5 ~ 30 V	1.7 %
Temperature	15 ~ 30 ℃	0.8 ℃
Humidity	40 ~ 80 %	3.8 %

Note: Please note that the measurement uncertainty are provided for informational purpose only and are not used in determining the Pass/Fail results.

1.9 List of Test Equipment

For Conducted measurements / RF Conducted Measurement Room

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	Spectrum analyzer	Keysight	N9010A	MY54200737	2018/10/24	2019/10/23
	Wideband Peak Power Meter	Anritsu	ML2495A	1733007	2018/10/25	2019/10/24
	Pulse Power Sensor + Precision Adaptor	Anritsu	MA2411B	1726022	2018/10/25	2019/10/24
✓	Temperature Chamber	TAICHY	MHK-225LK	1061121	2019/4/29	2020/4/28
	Wireless Connectivity Tester	R&S	CMW270	101307	2019/4/24	2020/4/23
	Attenuator	MVE	MVE2211-10	CT-9-056	2019/8/22	2020/8/21
	Attenuator	MVE	MVE2211-20	CT-9-057	2019/8/22	2020/8/21
	Attenuator	MVE	MVE2211-30	CT-9-058	2019/8/22	2020/8/21
	Power Divider	MVE	MVE8546	170826003	2019/8/22	2020/8/21
	Power Splitter	MVE	MVE8547	170302047	2019/8/28	2020/8/27
✓	DC Power Supply	GW INSTEK	GPC-3060D	GER817636	2019/8/21	2020/8/20

Remark: The test instruments marked with "✓" are used to measure the final test results.

For AC Conduction measurements / Conducted Room

	Equipment	Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	EMI Test Receiver	R&S	ESR3	102309	2019/5/16	2020/5/15
✓	2-Line V-Network LISN	R&S	ENV216	101185	2019/5/20	2020/5/19
✓	LISN	SCHWARZBECK	NSLK 8127RC	05028	2019/5/20	2020/5/19
✓	Transient Limiter	EM Electronics Corporation	EM-7600	857	2019/5/16	2020/5/15
✓	50ohm Cable	EMCI	EMCCFD300-BM-BM-5000	170613	2019/5/16	2020/5/15
✓	50 ohm terminal impedance	HUBER+SUHNER	50 ohm terminal impedance	CT-1-109-1	2019/5/13	2020/5/12

Remark:

1. All equipments are calibrated every one year.
2. The test instruments marked with "✓" are used to measure the final test results.
3. Test Software version: FARAD EZ-EMC Ver.EMC-CON 3A1

For Radiated measurements / 9x6x6 Semi Anechoic Room

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	Spectrum Analyzer	Keysight	N9010A	MY52220228	2019/4/25	2020/4/24
✓	EMI Receiver	Keysight	N9038A	MY51210173	2018/12/5	2019/12/4
✓	Pre-Amplifier	EMEC	EMC330	060668	2018/10/16	2019/10/15
	Pre-Amplifier	EMCI	EMC051845SE	980525	2018/10/11	2019/10/10
	Pre-Amplifier	EMCI	EMC184045SE	980515	2018/10/10	2019/10/9
	Pre-Amplifier	EMEC	EM01G18G	060648	2018/10/11	2019/10/10
✓	Cable	EMEC	EM-CB400	105060103	2018/10/18	2019/10/17
✓	Cable	EMEC	EM-CB400	105060102	2018/10/18	2019/10/17
✓	Cable	EMEC	EM-CB400	105060101	2018/10/18	2019/10/17
	Cable	EMCI	EMC102-KM-KM-600	170637	2018/10/10	2019/10/9
	Cable	HUBER+SUHNER	SF102	MY2751/2	2018/10/10	2019/10/9
	Cable	EMCI	EMC102-KM-KM-3000	170635	2018/10/10	2019/10/9
✓	Loop Antenna	EMCI	LPA600	277	2019/7/24	2020/7/23
✓	TRILOG super broad Antenna	Schwarzbeck	VULB 9168	VULB 9168-700 & 1421	2018/10/19	2019/10/18
	Horn Antenna	Schwarzbeck	BBHA 9120D	01557	2018/10/9	2019/10/8
	Horn Antenna	Schwarzbeck	BBHA 9170	703	2018/10/11	2019/10/10
	RF Filter	EMEC	BRF-2400-2500	002	2018/10/10	2019/10/9
	RF Filter	EMEC	BRF-5150-5350	104	2018/10/10	2019/10/9
	RF Filter	EMEC	BRF-5470-5725	092	2018/10/10	2019/10/9
	RF Filter	EMEC	BRF-5725-5875	091	2018/10/10	2019/10/9
	RF Filter	EMEC	HPF-2800	002	2018/10/10	2019/10/9
	RF Filter	EMEC	HPF-5850	059	2018/10/10	2019/10/9

Remark:

1. All equipments are calibrated every one year.
2. The test instruments marked with "✓" are used to measure the final test results.
3. Test Software version: FARAD EZ-EMC Ver.WD-03A1-1

2 Test Result

2.1 Antenna Requirement

2.1.1 Applicable Standard

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.

2.1.2 Antenna Connected Construction

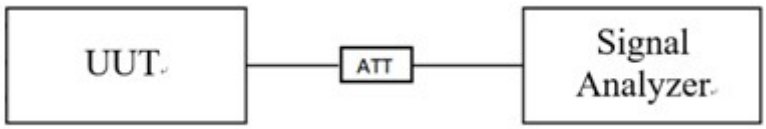
Non-standard antenna connector is used.

2.2 20dB Spectrum Bandwidth Measurement

2.2.1 Limit

Intentional radiators must be designed to ensure that the 20dB emission bandwidth in the specific band 13.553~13.567MHz.

2.2.2 Test Setup



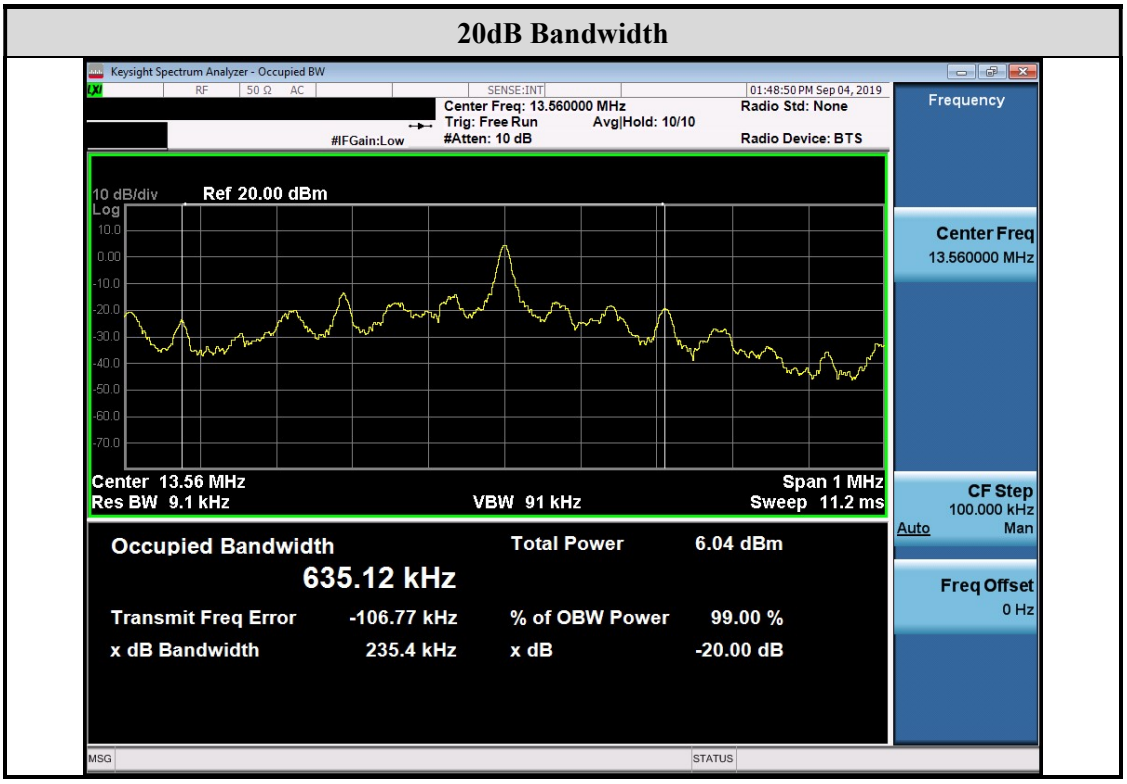
2.2.3 Test Procedure

Refer to ANSI C63.10 : 2013 clause 6.9

2.2.4 Test Result

Operating Frequency Band：13.553~13.567 MHz

20dB Bandwidth

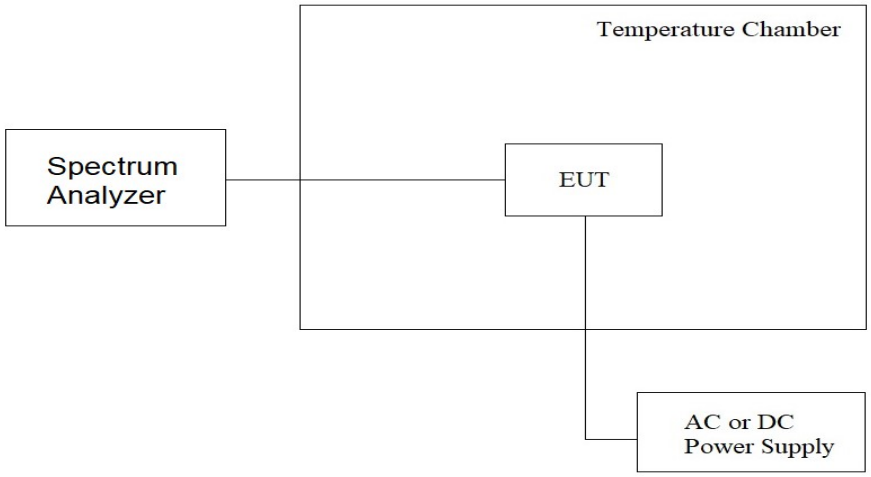


2.3 Frequency Stability Measurement

2.3.1 Limit

The frequency tolerance of the carrier signal shall be maintained within ± 0.01% (100ppm) of the operating frequency over a temperature variation of -20℃ to +50℃ at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 ℃.

2.3.2 Test Setup



2.3.3 Test Procedure

1. Set the spectrum analyzer span to view the entire emissions bandwidth.
2. The fc is declaring of channel frequency. Then the frequency error formula is (fc-f)/fc × 10^6 ppm and the limit is less than ±100ppm.
3. Extreme temperature rule is -20°C~50°C.

2.3.4 Test Result

Temperature (°C)	Voltage	Observe Time	Frequency	Delta Frequency (Hz)	Delta Frequency (%)	Limit (%)	Result
20	Normal	start	13.559487	-513	-0.0038	±0.01%	Pass
		2 min	13.559471	-529	-0.0039	±0.01%	Pass
		5 min	13.559615	-385	-0.0028	±0.01%	Pass
		10 min	13.559715	-285	-0.0021	±0.01%	Pass
20	High(+15%)	start	13.559478	-522	-0.0038	±0.01%	Pass
		2 min	13.559256	-744	-0.0055	±0.01%	Pass
		5 min	13.559824	-176	-0.0013	±0.01%	Pass
		10 min	13.559356	-644	-0.0047	±0.01%	Pass
20	Low(-15%)	start	13.559249	-751	-0.0055	±0.01%	Pass
		2 min	13.559475	-525	-0.0039	±0.01%	Pass
		5 min	13.559356	-644	-0.0047	±0.01%	Pass
		10 min	13.554180	-5820	-0.0429	±0.01%	Pass
50	Normal	start	13.559398	-602	-0.0044	±0.01%	Pass
		2 min	13.559258	-742	-0.0055	±0.01%	Pass
		5 min	13.559364	-636	-0.0047	±0.01%	Pass
		10 min	13.559715	-285	-0.0021	±0.01%	Pass
40	Normal	start	13.559428	-572	-0.0042	±0.01%	Pass
		2 min	13.559476	-524	-0.0039	±0.01%	Pass
		5 min	13.559973	-27	-0.0002	±0.01%	Pass
		10 min	13.559834	-166	-0.0012	±0.01%	Pass
30	Normal	Start	13.559256	-744	-0.0055	±0.01%	Pass
		2 min	13.559291	-709	-0.0052	±0.01%	Pass
		5 min	13.559315	-685	-0.0051	±0.01%	Pass
		10 min	13.559542	-458	-0.0034	±0.01%	Pass
10	Normal	Start	13.559217	-783	-0.0058	±0.01%	Pass
		2 min	13.559332	-668	-0.0049	±0.01%	Pass
		5 min	13.559364	-636	-0.0047	±0.01%	Pass
		10 min	13.559425	-575	-0.0042	±0.01%	Pass
0	Normal	start	13.559258	-742	-0.0055	±0.01%	Pass
		2 min	13.559442	-558	-0.0041	±0.01%	Pass
		5 min	13.559632	-368	-0.0027	±0.01%	Pass
		10 min	13.559648	-352	-0.0026	±0.01%	Pass

-10	Normal	start	13.559275	-725	-0.0053	±0.01%	Pass
		2 min	13.559781	-219	-0.0016	±0.01%	Pass
		5 min	13.559649	-351	-0.0026	±0.01%	Pass
		10 min	13.559248	-752	-0.0055	±0.01%	Pass
-20	Normal	star	13.559322	-678	-0.0050	±0.01%	Pass
		2 min	13.559665	-335	-0.0025	±0.01%	Pass
		5 min	13.559499	-501	-0.0037	±0.01%	Pass
		10 min	13.559256	-744	-0.0055	±0.01%	Pass

2.4 Field Strength of Fundamental Emissions Measurement

2.4.1 Limit

Rules and specifications	FCC Part 15 Subpart C Paragraph 15.225 Limits		
Freq. of Emission (MHz)	Field Strength (μV/m) at 30m	Field Strength (dBμV/m) at 30m	Field Strength (dBμV/m) at 1m
13.553~13.567	15848	84.0	143.0
13.410 – 13.553 and 13.567 – 13.710	334	50.5	109.6
13.110 – 13.410 and 13.710 – 14.010	106	40.5	99.6
Outside of the 13.110 – 14.010	See 15.209 Limits		

Remark:

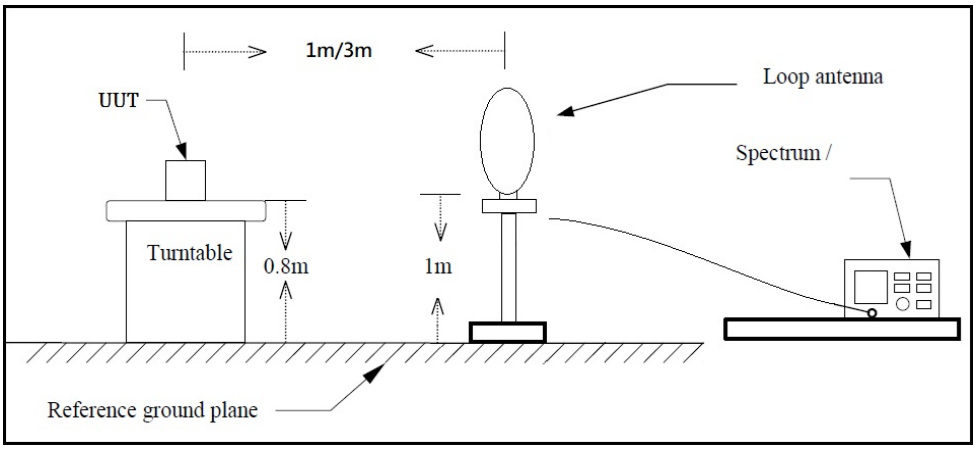
1. Emission level (dBμV/m) = 20 log Emission level (μV/m)
2. Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
3. The emission limit in this paragraph is based on measurement instrumentation employing an quasi-peak detector.

FCC Part 15 Subpart C Paragraph 15.209 Limits		
Frequency (MHz)	**Field Strength (μV/m)**	**Measurement Distance (m)**
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

Remark:

1. Emission level (dBμV/m) = 20 log Emission level (μV/m)
2. In the Above Table, the tighter limit applies at the band edges.
3. The emission limit in this paragraph is based on a measurement frequency below 1GHz instrumentation employing a quasi-peak detector.

2.4.2 Test Setup

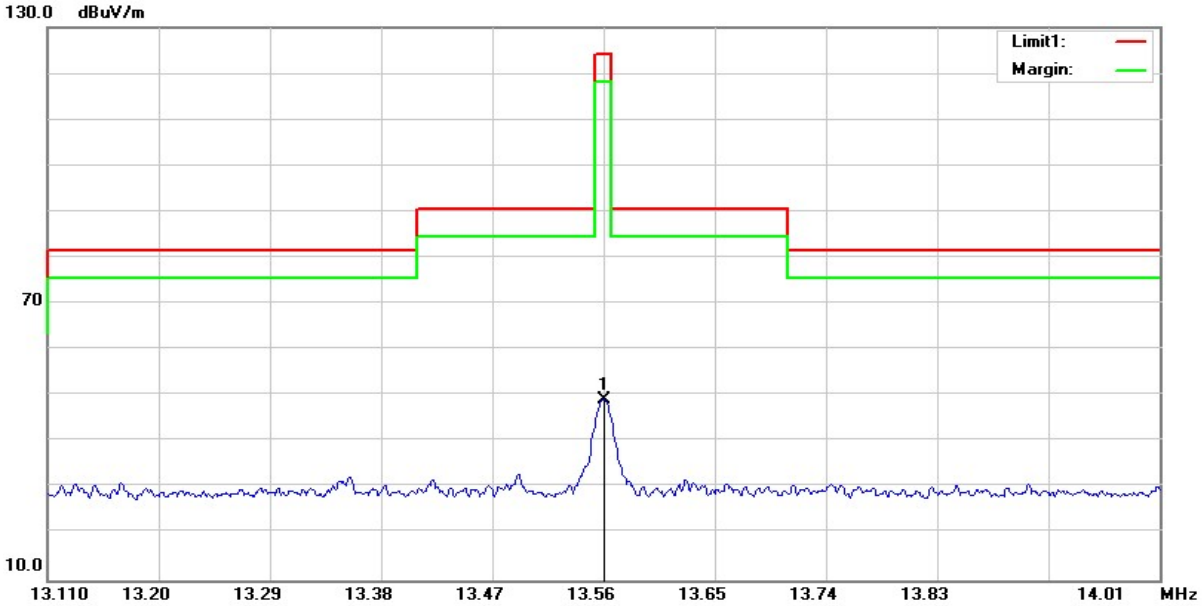


2.4.3 Test Procedure

1. For Fundamental emissions, use the receiver to measure QP reading.
2. When the radiated emissions limits are expressed in terms of the average value of the emissions, and pulsed operation is employed, the measurement field strength shall be determined by averaging over one complete pulse train, including blanking intervals, as long as the pulse train does not exceed 0.1 seconds. As an alternative (provided the transmitter operates for longer than 0.1 seconds) or in cases where the pulse train exceeds 0.1 seconds, the measured field strength shall be determined from the average absolute voltage during a 0.1 second interval during which the field strength is at its maximum value.
4. Compliance with the spectrum mask is tested with RBW = 9kHz.

2.4.4 Test Result

Test Mode :	Mode 1 ; Transmit RFID	Test Date :	2019/08/30
Test Frequency :	13.56 MHz	Temperature :	25 ℃
Polarization :	Horizontal ; X axis	Relative Humidity :	65 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5600	29.50	19.59	49.09	27.70	84.00	-56.30	QP

Remark：

(1) Correction Factor = Antenna factor + Cable loss – Amplifier gain

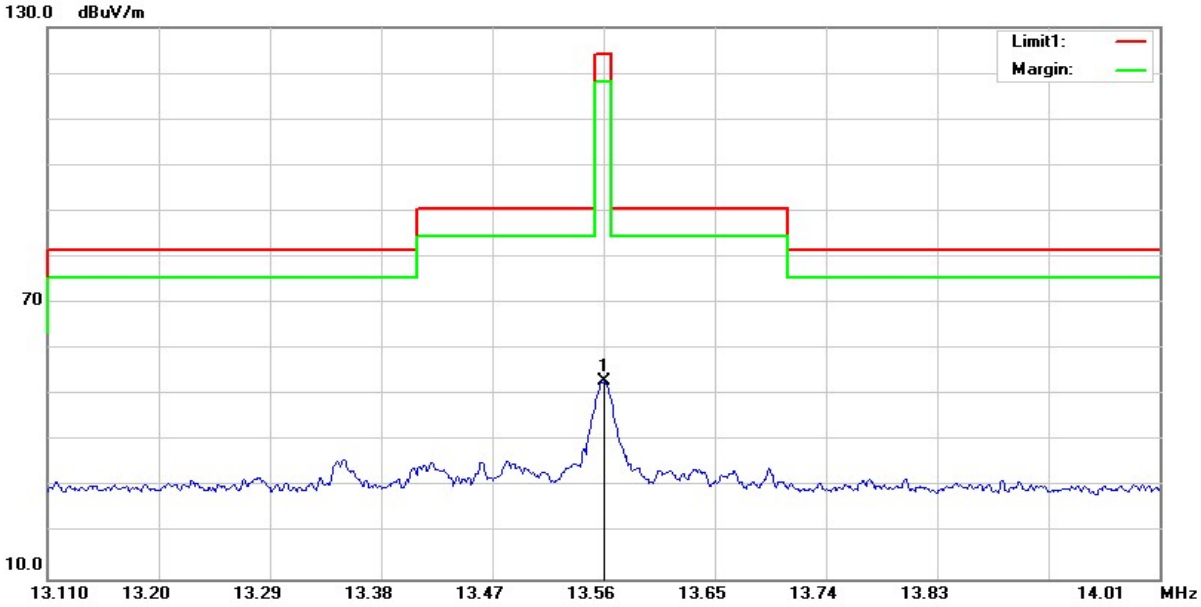
(2) Near-Field Result = Reading Level + Correct Factor

(3) The actual measured value is used to calculate the derived value by the measurement method of ANSI C63.10(2) in 6.4.4.2.

$FS_{limit} = FS_{max} – 40\log(d_{near\ field}/d_{measure}) – 20\log(d_{limit}/d_{near\ field})$

(4) Margin Level = Derived Value – Limit Value

Test Mode :	Mode 1 ; Transmit RFID	Test Date :	2019/08/30
Test Frequency :	13.56 MHz	Temperature :	25 ℃
Polarization :	Vertical ; X axis	Relative Humidity :	65 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Derived Value (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	13.5600	33.33	19.59	52.92	31.53	84.00	-52.47	QP

Remark :

(1) Correction Factor = Antenna factor + Cable loss – Amplifier gain

(2) Near-Field Result = Reading Level + Correct Factor

(3) The actual measured value is used to calculate the derived value by the measurement method of ANSI C63.10(2) in 6.4.4.2.

$FS_{limit} = FS_{max} – 40\log(d_{near\ field}/d_{measure}) – 20\log(d_{limit}/d_{near\ field})$

(4) Margin Level = Derived Value – Limit Value

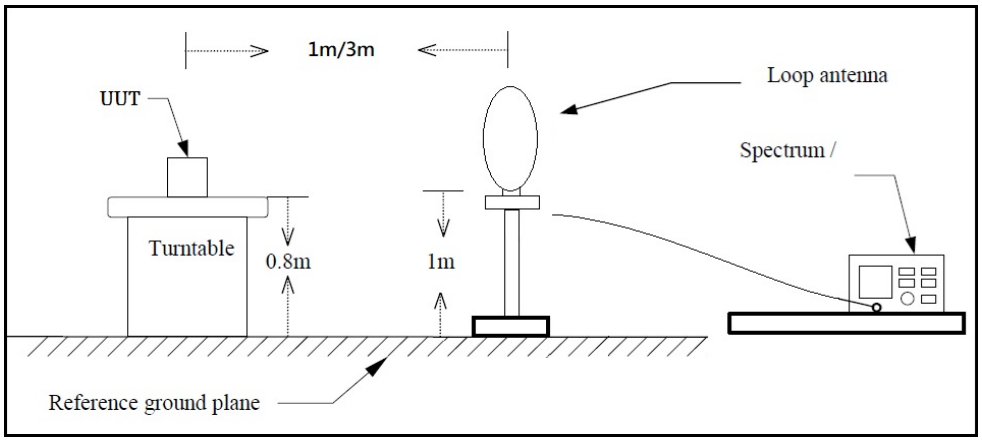
2.5 Radiated Emissions Measurement

2.5.1 Limit

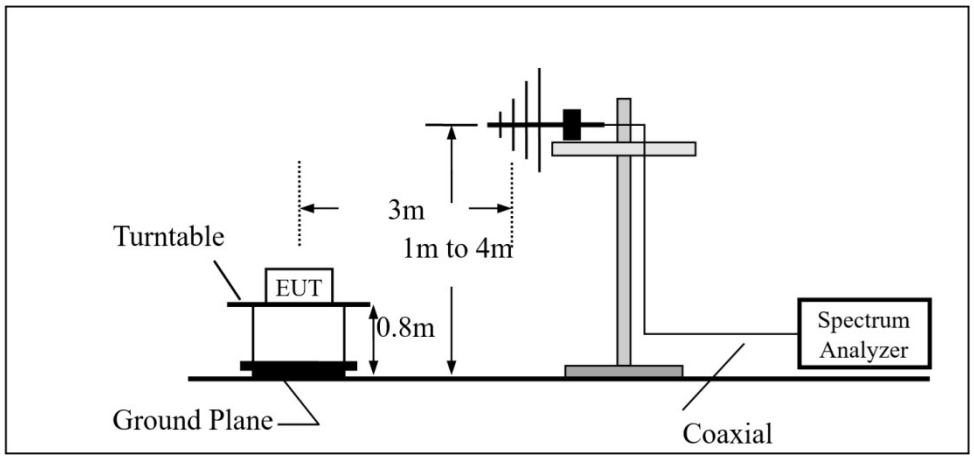
The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in Section 15.209. In addition, radiated emissions which fall in the restricted bands, as defined in Section 15.205, must also comply with the radiated emission limits specified in Section 15.209

2.5.2 Test Setup

Below 30MHz



Above 30MHz



2.5.3 Test Procedure

The EUT was setup according to ANSI C63.10, 2013 for compliance to FCC 47CFR 15.225 requirements.

For Radiated emission below 30MHz

(1) The EUT was placed on the top of a rotating table 0.8 meters above the ground in a 3 meter chamber room. The table was rotated 360 degrees to determine the position of the highest radiation.

(2) The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.

(3) Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

(4) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

(5) The test-receiver system was set to Quasi-Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.

For Radiated emission Above 30MHz

(1) The EUT was placed on the top of a rotating table 0.8 meters above the ground at 3 meter chamber room for the test. The table was rotated 360 degrees to determine the position of the highest radiation.

(2) The EUT was set 3 meters away from the interference-receiving antenna, the height of the antenna is varied from 1 meter to 4 meters above the ground to determine the maximum value of the field strength.

(3) Parallel, perpendicular, and ground-parallel orientations of the antenna are set to make the measurement.

(4) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

(5) The test-receiver system was set to quasi-peak detect function and specified bandwidth with maximum hold mode when the test frequency is below 1 GHz.

2.5.4 Test Result

Below 30 MHz Data

Test Mode :	Mode 1 ; Transmit RFID	**Test Date :**	2019/08/30
Test Frequency :	13.56 MHz	**Temperature :**	25 ℃
Polarization :	Horizontal ; X axis	**Relative Humidity :**	65 %

No.	Frequency (MHz)	Reading (dBuA/m)	Correct Factor (dB/m)	Near-Field Result (dBuA/m)	Derived Value (dBuA/m)	Limit (dBuA/m)	Margin (dB)	Remark
1	0.0314	39.05	58.88	97.93	3.83	37.67	-33.83	AVG
2	0.9858	13.27	28.88	42.15	-2.01	27.73	-29.74	QP
3	5.7320	23.49	6.23	29.72	0.85	29.54	-28.69	QP
4	11.7318	13.51	18.01	31.52	8.87	29.54	-20.67	QP
5	22.5674	12.69	26.12	38.81	21.83	29.54	-7.72	QP
6	29.6716	13.66	28.95	42.61	28.02	29.54	-1.53	QP

Remark：

(1) Correction Factor = Antenna factor + Cable loss – Amplifier gain

(2) Near-Field Result = Reading Level + Correct Factor

(3) The actual measured value is used to calculate the derived value by the measurement method of ANSI C63.10(2) in 6.4.4.2.

$FS_{limit} = FS_{max} - 40\log(d_{near\ field}/d_{measure}) - 20\log(d_{limit}/d_{near\ field})$

(4) Margin Level = Derived Value – Limit Value

(5) The other emission levels were very low against the limit

Test Mode :	Mode 1 ; Transmit RFID	Test Date :	2019/08/30
Test Frequency :	13.56 MHz	Temperature :	25 ℃
Polarization :	Vertical ; X axis	Relative Humidity :	65 %

No.	Frequency (MHz)	Reading (dBuA/m)	Correct Factor (dB/m)	Near-Field Result (dBuA/m)	Derived Value (dBuA/m)	Limit (dBuA/m)	Margin (dB)	Remark
1	0.0206	45.61	62.82	108.43	10.67	41.33	-30.66	AVG
2	1.6126	10.49	25.10	35.59	-4.30	23.45	-27.75	QP
3	5.7021	25.44	6.16	31.60	2.69	29.54	-26.85	QP
4	11.7318	12.74	18.01	30.75	8.10	29.54	-21.44	QP
5	24.3584	14.02	26.84	40.86	24.56	29.54	-4.99	QP
6	27.1344	41.46	0.00	41.46	26.09	29.54	-3.45	QP

Remark :

(1) Correction Factor = Antenna factor + Cable loss – Amplifier gain

(2) Near-Field Result = Reading Level + Correct Factor

(3) The actual measured value is used to calculate the derived value by the measurement method of ANSI C63.10(2) in 6.4.4.2.

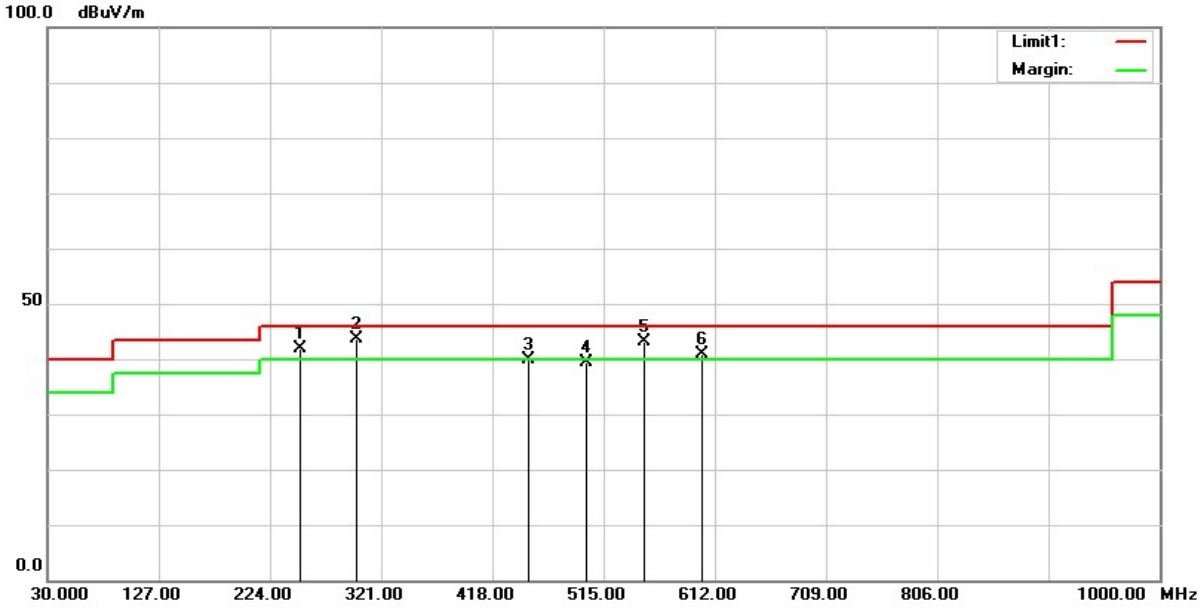
$FS_{limit} = FS_{max} – 40\log(d_{near\ field}/d_{measure}) – 20\log(d_{limit}/d_{near\ field})$

(4) Margin Level = Derived Value – Limit Value

(5) The other emission levels were very low against the limit

Above 30MHz Data

Test Mode :	Mode 1 ; Transmit RFID	Test Date :	2019/08/30
Test Frequency :	13.56 MHz	Temperature :	25 ℃
Polarization :	Horizontal	Relative Humidity :	65 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	250.0000	52.59	-10.75	41.84	46.00	-4.16	QP
2	300.0000	52.70	-9.19	43.51	46.00	-2.49	QP
3	450.0100	45.17	-5.27	39.90	46.00	-6.10	QP
4	500.4500	43.79	-4.40	39.39	46.00	-6.61	QP
5	549.9200	46.49	-3.37	43.12	46.00	-2.88	QP
6	600.3600	42.78	-2.02	40.76	46.00	-5.24	QP

Remark :

(1) Correction Factor = Antenna factor + Cable loss –Amplifier gain

(2) Result Value = Reading Level + Correct Factor

(3) Margin Level = Measurement Value –Limit Value

(4) The other emission levels were very low against the limit

Test Mode :	Mode 1 ; Transmit RFID	Test Date :	2019/08/30
Test Frequency :	13.56 MHz	Temperature :	25 ℃
Polarization :	Vertical	Relative Humidity :	65 %

No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	199.7500	44.99	-12.53	32.46	43.50	-11.04	QP
2	250.1900	49.73	-10.75	38.98	46.00	-7.02	QP
3	299.6600	49.34	-9.19	40.15	46.00	-5.85	QP
4	450.0100	42.70	-5.27	37.43	46.00	-8.57	QP
5	500.4500	45.54	-4.40	41.14	46.00	-4.86	QP
6	600.3600	39.98	-2.02	37.96	46.00	-8.04	QP

Remark :

(1) Correction Factor = Antenna factor + Cable loss –Amplifier gain

(2) Result Value = Reading Level + Correct Factor

(3) Margin Level = Measurement Value –Limit Value

(4) The other emission levels were very low against the limit

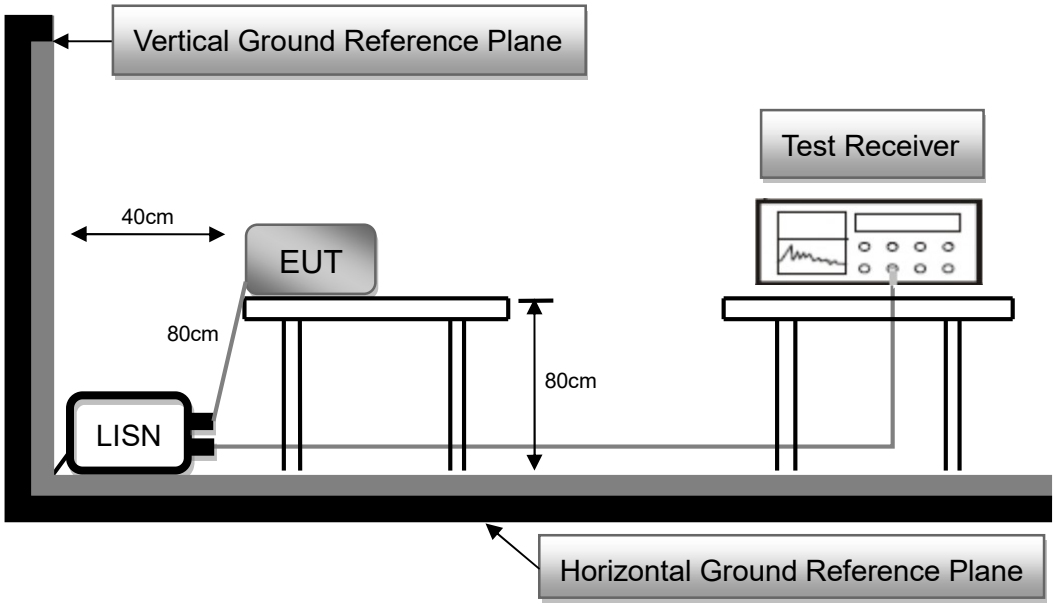
2.6 AC Conducted Emissions Measurement

2.6.1 Limit

Frequency (MHz)	FCC Part 15 Subpart C Paragraph 15.207 (dBμV) Limit	
	Quasi-peak	Average
0.15 to 0.5	66 to 56*	56 to 46*
0.50 to 5.0	56	46
5.0 to 30.0	60	50

*Decreases with the logarithm of the frequency

2.6.2 Test Setup

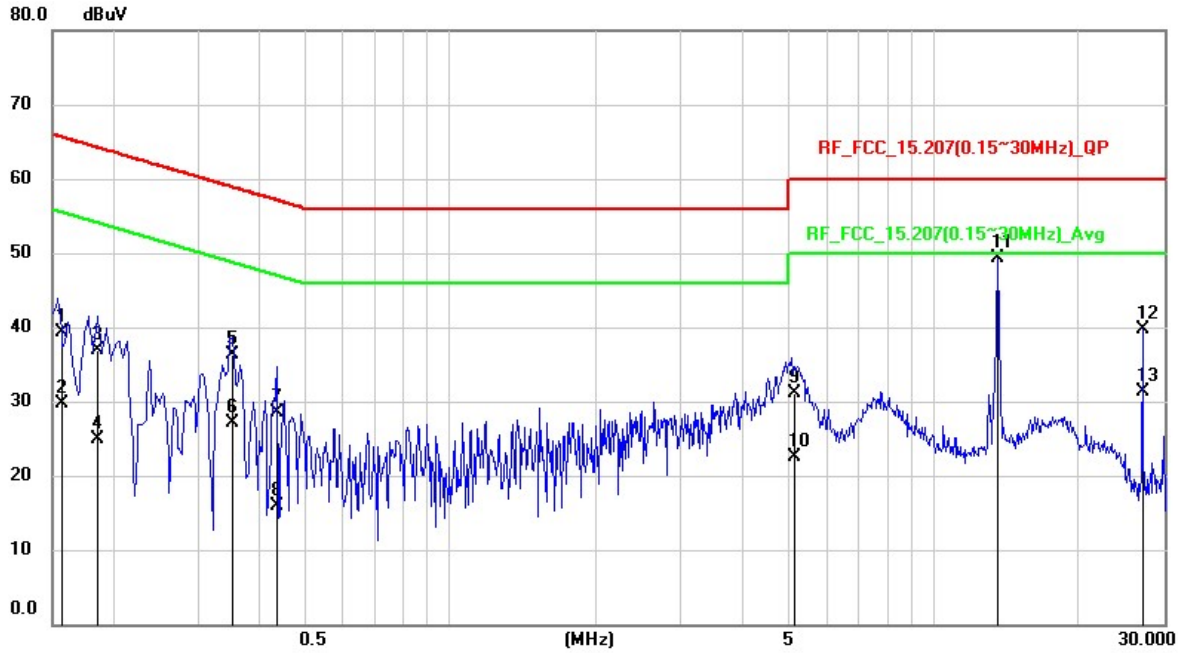


2.6.3 Test Procedure

1. The EUT was placed 0.8 meter height wooden table from the horizontal ground plane with EUT being connected to power source through a line impedance stabilization network (LISN). The LISN at least be 80 cm from nearest chassis of EUT.
2. The line impedance stabilization network (LISN) provides 50 ohm/50uH of coupling impedance for the measuring instrument. All other support equipments powered from additional LISN(s).
3. Interrelating cables that hang closer than 40 cm to the ground plane shall be folded back and forth in the center forming a bundle. All I/O cables were positioned to simulate typical usage.
4. All I/O cables that are not connected to a peripheral shall be bundle in the center. The end of the cable may be terminated, if required, using the correct terminating impedance. The overall length shall not exceed 1 m.
5. The EMI test receiver connected to LISN powering the EUT. The actual test configuration, please refer to EUT test photos.
6. The receiver scanned from 150kHz to 30MHz for emissions in each of test modes. A scan was taken on both power lines, Line and Neutral, recording at least six highest emissions.
7. The EUT and cable configuration of the above highest emission levels were recorded. The Test Data of the worst case was recorded.

2.6.4 Test Result

Test Voltage :	110Vac, 60Hz	**Frequency Range:**	0.15-30 MHz
Test Mode :	Mode 1 ; Transmit RFID	**6dB Bandwidth :**	9 kHz
Test Date :	2019/09/12	**Phase :**	L
Temperature :	25℃	**Humidity :**	65 %

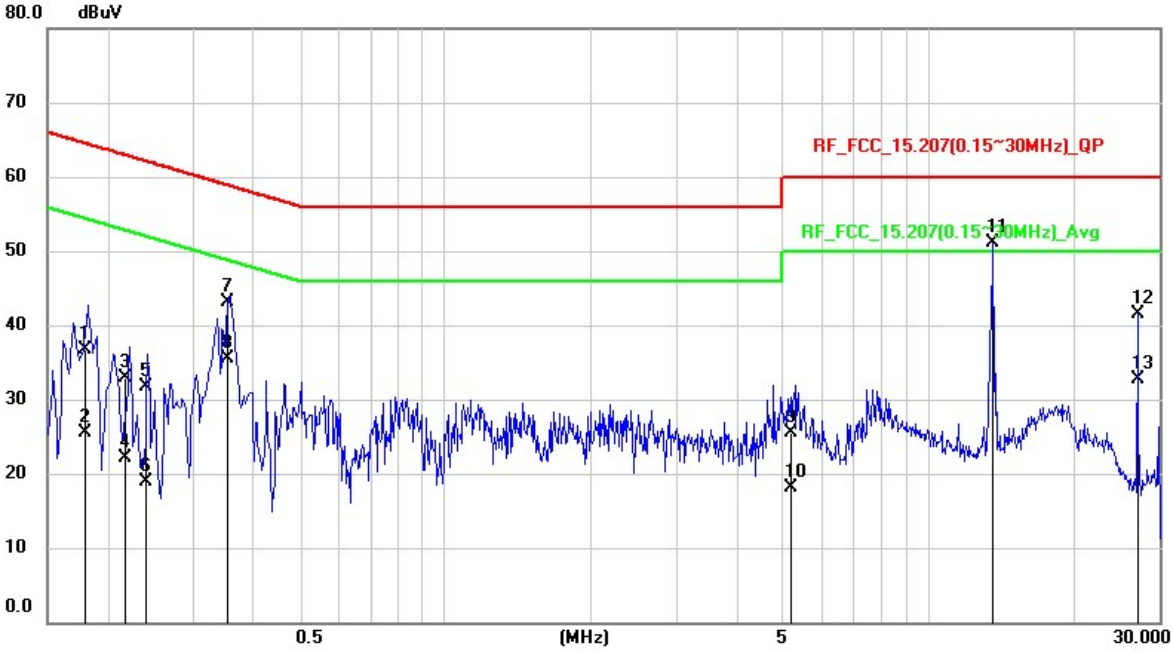


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.158	29.43	9.81	39.24	65.57	-26.33	QP
2	0.158	19.84	9.81	29.65	55.57	-25.92	AVG
3	0.1845	27.15	9.81	36.96	64.28	-27.32	QP
4	0.1845	15.1	9.81	24.91	54.28	-29.37	AVG
5	0.3521	26.42	9.8	36.22	58.91	-22.69	QP
6	0.3521	17.28	9.8	27.08	48.91	-21.83	AVG
7	0.4381	18.74	9.81	28.55	57.1	-28.55	QP
8	0.4381	6.05	9.81	15.86	47.1	-31.24	AVG
9	5.1501	21.2	9.98	31.18	60	-28.82	QP
10	5.1501	12.5	9.98	22.48	50	-27.52	AVG
11	*13.5579	39.08	10.16	49.24	60	-10.76	peak
12	27.1201	29.21	10.48	39.69	60	-20.31	QP

Remark:

1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value
5. The test frequency marked with “*” is RF Tx

Test Voltage :	110Vac, 60Hz	Frequency Range:	0.15-30 MHz
Test Mode :	Mode 1 ; Transmit RFID	6dB Bandwidth :	9 kHz
Test Date :	2019/09/12	Phase :	N
Temperature :	25℃	Humidity :	65 %



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1792	26.82	9.79	36.61	64.52	-27.91	QP
2	0.1792	15.68	9.79	25.47	54.52	-29.05	AVG
3	0.2177	23.03	9.79	32.82	62.91	-30.09	QP
4	0.2177	12.36	9.79	22.15	52.91	-30.76	AVG
5	0.2389	21.98	9.79	31.77	62.13	-30.36	QP
6	0.2389	9.14	9.79	18.93	52.13	-33.2	AVG
7	0.354	33.23	9.79	43.02	58.87	-15.85	QP
8	0.354	25.62	9.79	35.41	48.87	-13.46	AVG
9	5.2011	15.45	9.96	25.41	60	-34.59	QP
10	5.2011	8.12	9.96	18.08	50	-31.92	AVG
11	*13.562	41.06	10.11	51.17	60	-8.83	peak
12	27.1198	31.15	10.4	41.55	60	-18.45	QP

Remark:

1. QP = Quasi Peak, AVG = Average
2. Correction Factor = Insertion loss of LISN + Cable loss
3. Measurement Value = Reading Level + Correct Factor
4. Margin Level = Measurement Value –Limit Value
5. The test frequency marked with “*” is RF Tx

- END ---