FCC Test Report

Report No: WD-RF-R-230052-B0

Product Name	**:**	Dual Frequency RFID Multi-ISO Protocol Modules
Model Name	**:**	QD60
FCC ID	**:**	WXAQD60
Applicant	**:**	GIGA-TMS INC.
Received Date	**:**	Dec. 06, 2022
Tested Date	**:**	Feb. 22, 2023 ~ Mar. 13, 2023
Applicable Standard	**:**	47 CFR FCC Part 15, Subpart C (Section 15.209) ANSI C63.10 : 2013

Testing Laboratory
2965

Wendell Industrial Co., Ltd
Wendell EMC & RF Laboratory

Caution:
This report sets forth our findings solely with respect to the test samples identified herein. The results set forth in this report are not indicative or representative of the quality or characteristics of the lot from which a test sample was taken or any similar or identical product unless specifically and expressly noted.
The test results shown in the test report are traceable to the national/international standard through the calibration report of the equipment.
Please note that the measurement uncertainty are provided for informational purpose only and are not used in determining the Pass/Fail results.
This report must not be used to claim product endorsement by TAF or any agency of the government.
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Test Report

Issued Date: March 14, 2023

Project No.: 22Q120603

Product Name	Dual Frequency RFID Multi-ISO Protocol Modules
Trade Name	PROMAG
Model Name	QD60
FCC ID	WXAQD60
Applicant	GIGA-TMS INC.
Manufacturer	GIGA-TMS INC.
EUT Rated Voltage	DC 5V
EUT Test Voltage	AC 120V / 60Hz
EUT Supports Radios Application	RFID 13.56 MHz RFID 125k Hz
Applicable Standard	47 CFR FCC Part 15, Subpart C (Section 15.209) ANSI C63.10 : 2013
Test Result	Complied

Documented : Emma Lu

(Specialist / Emma Lu)

Technical Engineer : Jack Chang

(Section Manager / Jack Chang)

Approved : Gary Wu

(Project Manager / Gary Wu)

Table of Contents

Document Revision History

Report No.	Issue date	Description
WD-RF-R-230052-B0	March 14, 2023	Initial report

Summary of Test Result

Ref. Std. Clause	Test Items	Result
15.203	Antenna Requirement	Pass
15.209	Radiated Emissions	Pass
15.207	AC Conducted Emission	Pass

1 Generation Information

1.1 Applicant

GIGA-TMS INC.
8F, NO.31, LANE 169, KANG-NING ST.,HSI-CHIH, NEW TAIPEI CITY, Taiwan

1.2 Manufacturer

GIGA-TMS INC.
8F, NO.31, LANE 169, KANG-NING ST.,HSI-CHIH, NEW TAIPEI CITY, Taiwan

1.3 Description of Equipment under Test

Product Name	Dual Frequency RFID Multi-ISO Protocol Modules
Model No.	QD60
FCC ID	WXAQD60
Frequency Range	125 kHz
Type of Modulation	ASK
Antenna Information	Refer to the table “Antenna List”
EUT Supports Radios Application	RFID 13.56 MHz RFID 125k Hz
EUT Rated Voltage	DC 5V
EUT Test Voltage	AC 120V / 60Hz

Antenna List

No.	Manufacturer	Model No.	Antenna Type	Peak Gain	Remark
1	Shenzhen Xinlifeng Technology Co., Ltd	ANT-T044	Loop Antenna	N/A	For 125kHz

Channel List

Channel	Frequency (kHz)
01	125

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**	Dual Frequency RFID Multi-ISO Protocol Modules
2	**Model No.**	QD60
3	**Test SW Version**	PROMAG Multi-Protocol Studio_Ver:7.8R0
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 (kHz)	Set Value
ASK	01	125	Default

Test Mode

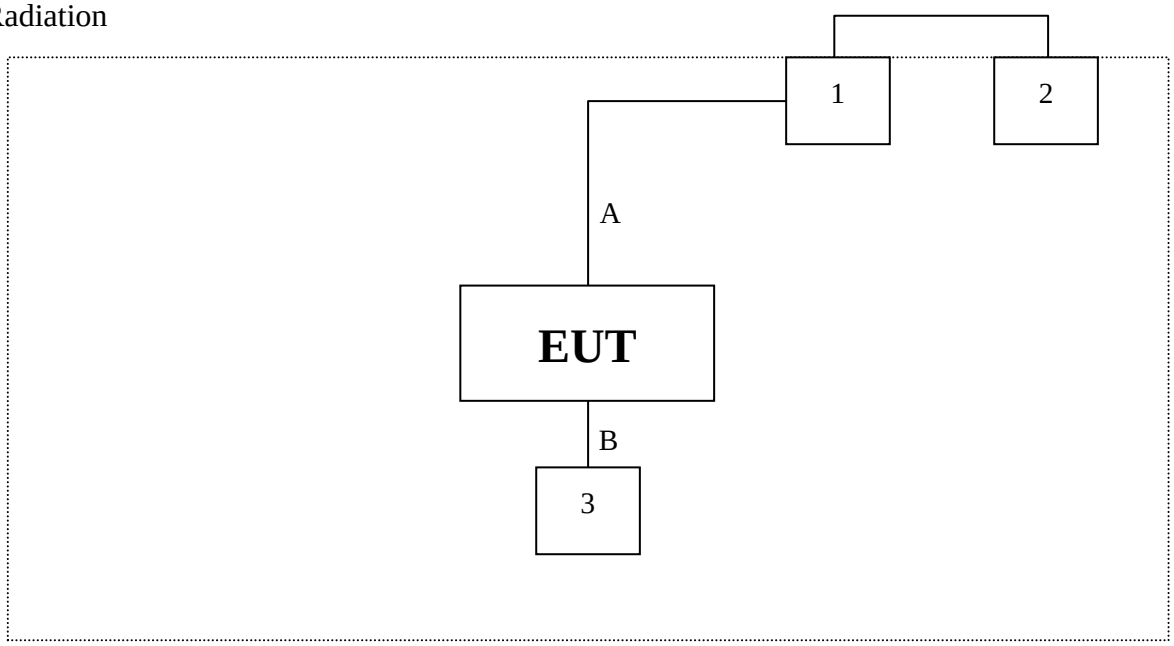
Mode 1	Transmit
Mode 2	Standby

Note:

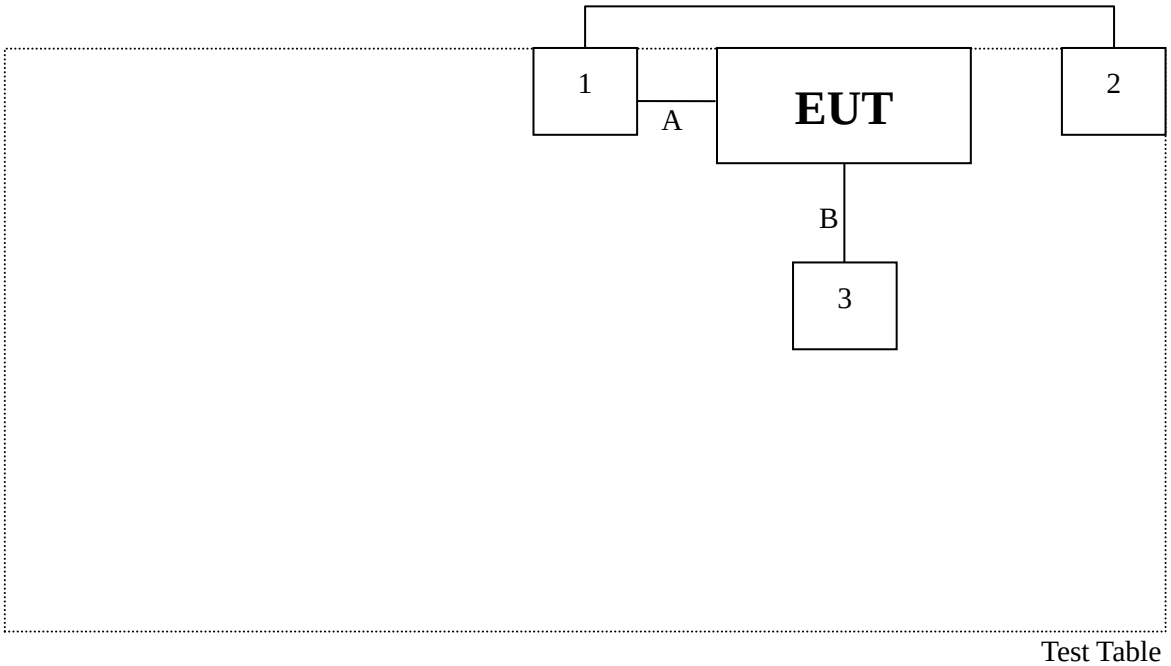
1. This device is a Dual Frequency RFID Multi-ISO Protocol Modules with a built-in RFID transceiver.
2. These tests were performed on a sample of equipment to demonstrate compliance with 47 CFR FCC Part 15, Subpart C (Section 15.209).
3. The radiation measurements are performed in X, Y, Z axis positioning. Only the X axis worst case is shown in the report.

1.4 Configuration of Tested System

Radiation



AC Conduction



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	Notebook PC	acer	N17W3	NXVJ7TA00302301D496600	N/A
2	Adapter	Acer	W15-045N4A	KP045H006946019 69PH05	Non-shielded, 1 Core, 1.6m
3	13.56 MHz Antenna	N/A	N/A	N/A	N/A
	125 kHz Antenna	Shenzhen Xinlifeng Technology Co., Ltd	ANT-T044	N/A	N/A

No.	Signal Cable Type	Signal cable Description
A	USB Cable	Non-shielded, Non-Core, 0.35m
B	Data Cable	Non-shielded, Non-Core, 0.16m

1.7 Test Facility

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

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 EMC & RF Laboratory

Test Location: No. 119, Wugong 3rd Rd., Wugu Dist.,
New Taipei City 248, Taiwan (R.O.C.)

Designation Number: TW0025

Test Firm Registration Number: 665221

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	Condition	Expended Uncertainty
AC Conducted Emission	0.150 ~ 30 MHz	± 2.64 dB
Radiated Emission	0.009 ~ 30 MHz	± 3.7 dB
	30 ~ 1000 MHz	± 3.9 dB
	1000 ~ 18000 MHz	± 4.5 dB
	18000 ~ 40000 MHz	± 4.3 dB
RF Power, Conducted	Conducted Measuring	± 0.75 dB
Occupied Bandwidth	Conducted Measuring	± 2.4 %
Power Density	Conducted Measuring	± 1.2 dB
Duty Cycle and Dwell Time	Conducted Measuring	± 0.9 %
Conducted Unwanted Emission Strength	Conducted Measuring	± 1.4 dB
DC Power Supply	--	± 2.0 %
Temperature	--	± 0.55 ℃
Humidity	--	± 3.1 %

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 AC Conduction measurements / W08-CE

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	EMI Test Receiver	R&S	ESR3	102309	2022/6/15	2023/6/14
✓	2-Line V-Network LISN	R&S	ENV216	101185	2022/6/20	2023/6/19
✓	LISN	SCHWARZBECK	NSLK 8127RC	05028	2022/6/20	2023/6/19
✓	Transient Limiter	EM Electronics Corporation	EM-7600	857	2022/6/20	2023/6/19
✓	50ohm Cable	EMCI	EMCCFD300-BM-BM-5000	170612	2022/6/17	2023/6/16
✓	50 ohm terminal impedance	HUBER+SUHNER	50 ohm terminal impedance	CT-1-109-1	2022/6/17	2023/6/16

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 / W08-996-2

Equipment		Manufacturer	Model No.	Serial No.	Cal. Date	Due Date
✓	EMI Receiver	Keysight	N9038A	MY51210173	2022/08/17	2023/08/16
✓	Spectrum Analyzer	Keysight	N9010A	MY52220228	2022/08/16	2023/08/15
✓	Loop Antenna	EMCI	LPA600	277	2022/08/22	2023/08/21
✓	TRILOG super broad Antenna	Schwarzbeck	VULB 9168	VULB 9168-700 & 20E03	2022/08/12	2023/08/11
	Horn Antenna	Schwarzbeck	BBHA 9120D	01767	2022/08/24	2023/08/23
	Horn Antenna	Schwarzbeck	BBHA 9170	703	2022/08/29	2023/08/28
✓	Pre-Amplifier	EMEC	EMC330	060774	2022/08/17	2023/08/16
	Pre-Amplifier	EMEC	EM01G18G	060648	2022/08/18	2023/08/17
	Pre-Amplifier	JPT	JPA0118-55-303K	1910001800055003	2022/08/18	2023/08/17
	Pre-Amplifier	EMCI	EMC184045SE	980515	2022/08/18	2023/08/17
✓	Cable	EMEC	EM-CB400	105060103	2022/08/18	2023/08/17
✓	Cable	EMEC	EM-CB400	105060102	2022/08/18	2023/08/17
✓	Cable	EMEC	EM-CB400	105060101	2022/08/18	2023/08/17
	RF Cable	HUBER+SUHNER	SF102	MY2752/2	2022/08/17	2023/08/16
	RF Cable	MVE	280280.LL266.1200	B60028C	2022/08/17	2023/08/16
	RF Cable	EMCI	EMC102-KM-KM-600	190646	2022/08/17	2023/08/16
	RF Cable	MVE	140140.LL404.700	B90014C	2022/07/28	2023/07/27
	RF Cable	MVE	140140.LL404.300	B90006C	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-2400-2500	002	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-5150-5350	104	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-5470-5725	092	2022/08/17	2023/08/16
	RF Filter	EMEC	BRF-5725-5875	091	2022/08/17	2023/08/16
	RF Filter	EMEC	HPF-2800	002	2022/08/17	2023/08/16
	RF Filter	EMEC	HPF-5850	059	2022/08/17	2023/08/16
	SMA Notch Filter	MVE	MFN-902.928.S1	190604001	2022/08/17	2023/08/16

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.

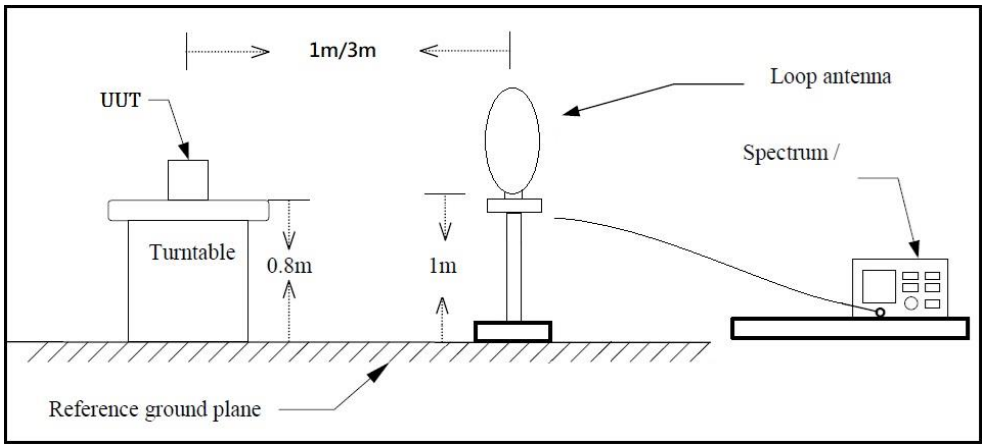
2.2 Radiated Emissions Measurement

2.2.1 Limit

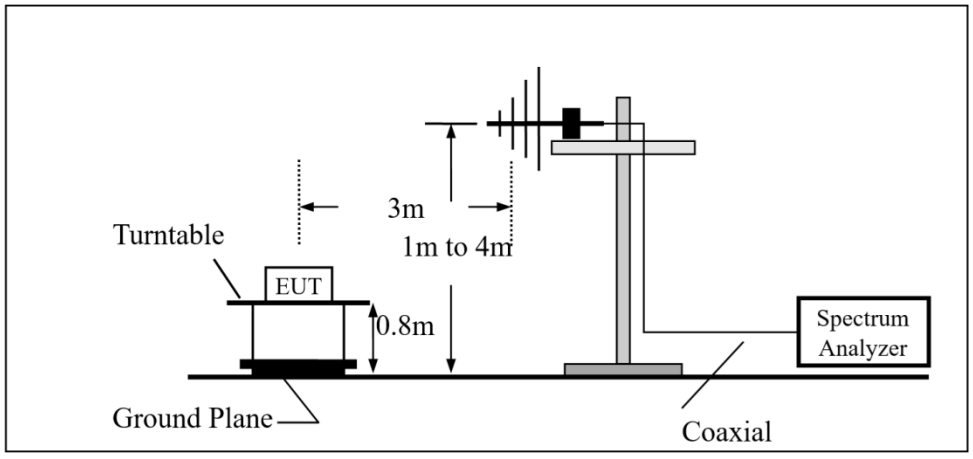
Frequency (MHz)	Field Strength (microvolts / meter)	Measurement Distance (meters)
0.009 ~ 0.490	2400 / F(kHz)	300
0.490 ~ 1.705	24000 / F(kHz)	30
1.705 ~ 30.0	30	30
30 ~ 88	100	3
88 ~ 216	150	3
216 ~ 960	200	3
Above 960	500	3

2.2.2 Test Setup

Below 30MHz



Above 30MHz



2.2.3 Test Procedure

The EUT was setup according to ANSI C63.10, 2013 for compliance to FCC 47CFR 15.209 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.

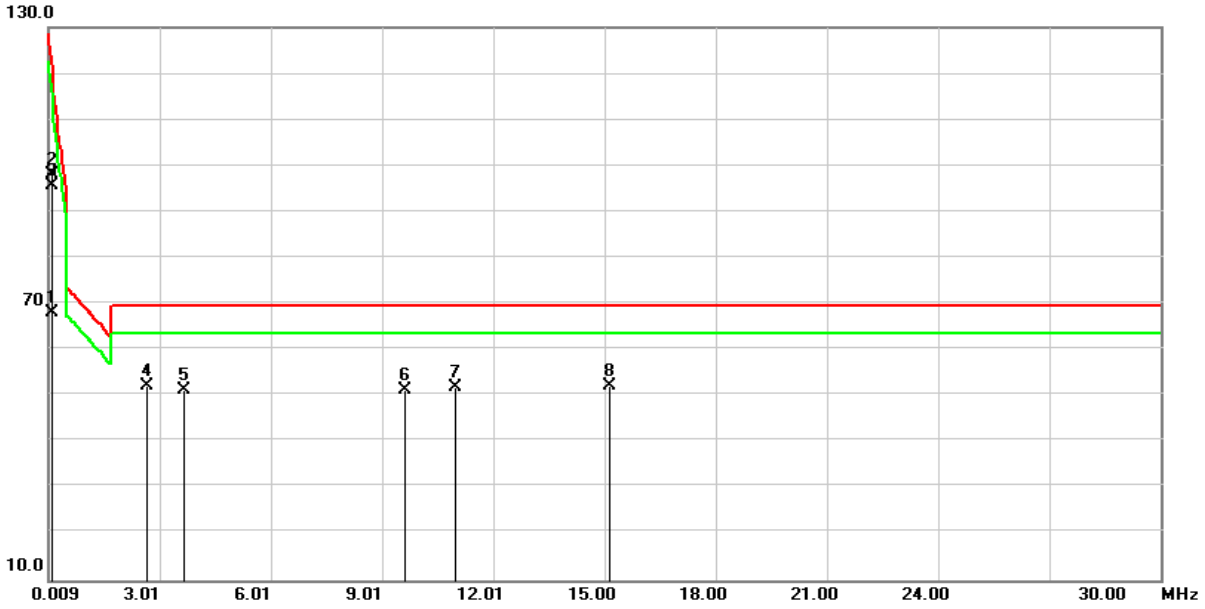
(4) For each suspected emission, the EUT was arranged to its worst case and the rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.

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

2.2.4 Test Result

Below 30 MHz Data

Test Mode :	Mode 1: Transmit	**Test Date :**	2023/02/24
Test Frequency:	125 KHz.	**Temperature :**	20.1 ℃
Polarization :	X axis; Horizontal	**Relative Humidity :**	43.1 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0974	10.3200	57.6200	67.9400	107.8330	-39.8930	QP
2	0.1250	41.7700	56.2200	97.9900	125.6700	-27.6800	Peak
3	0.1250	39.3600	56.2200	95.5800	105.6660	-10.0860	AVG
4	2.6872	14.2400	37.9300	52.1700	69.5424	-17.3724	QP
5	3.6723	14.2200	37.0700	51.2900	69.5424	-18.2524	QP
6	9.6125	12.7400	38.4200	51.1600	69.5424	-18.3824	QP
7	10.9855	13.5200	38.4500	51.9700	69.5424	-17.5724	QP
8	15.1347	14.1500	37.9700	52.1200	69.5424	-17.4224	QP

Remark：

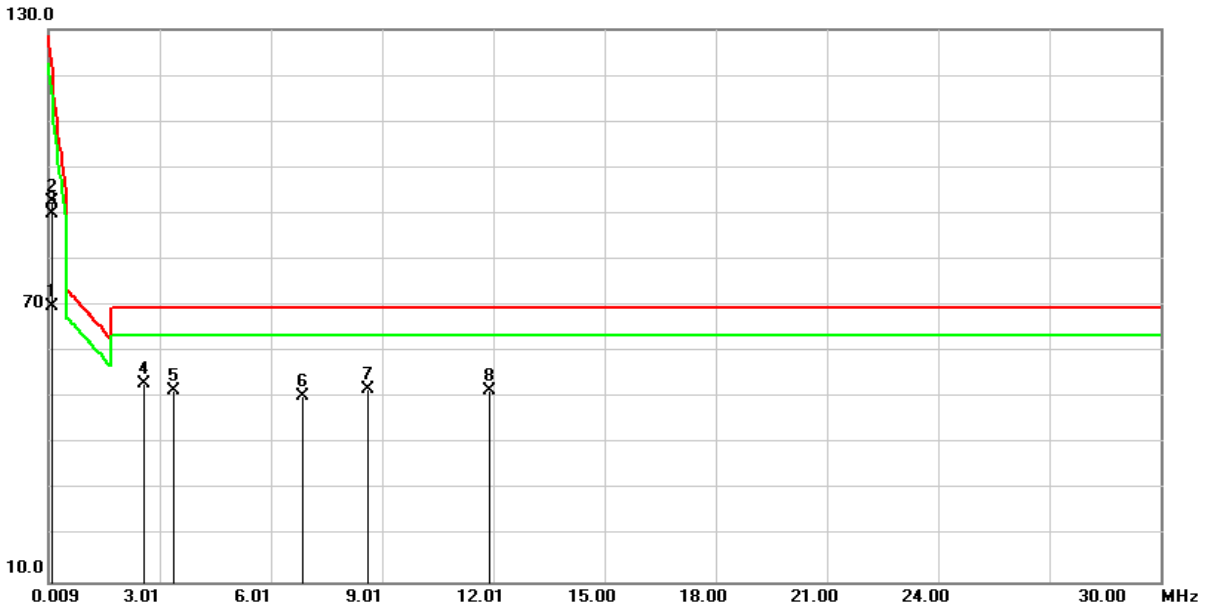
(1) Correction Factor = Antenna factor + Cable loss – Amplifier gain

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

(3) Margin Level = Derived Value – Limit Value

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

Test Mode :	Mode 1: Transmit	Test Date :	2023/02/24
Test Frequency:	125 KHz.	Temperature :	20.1 ℃
Polarization :	X axis; Vertical	Relative Humidity :	43.1 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Near-Field Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	0.0946	11.8600	58.0100	69.8700	108.0864	-38.2164	QP
2	0.1250	36.3700	56.2200	92.5900	125.6700	-33.0800	Peak
3	0.1250	33.8800	56.2200	90.1000	105.6660	-15.5660	AVG
4	2.5678	14.9300	38.1700	53.1000	69.5424	-16.4424	QP
5	3.3440	14.2700	37.1700	51.4400	69.5424	-18.1024	QP
6	6.8364	13.1300	37.3600	50.4900	69.5424	-19.0524	QP
7	8.6274	13.7400	38.0500	51.7900	69.5424	-17.7524	QP
8	11.9108	13.2200	38.3400	51.5600	69.5424	-17.9824	QP

Remark：

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

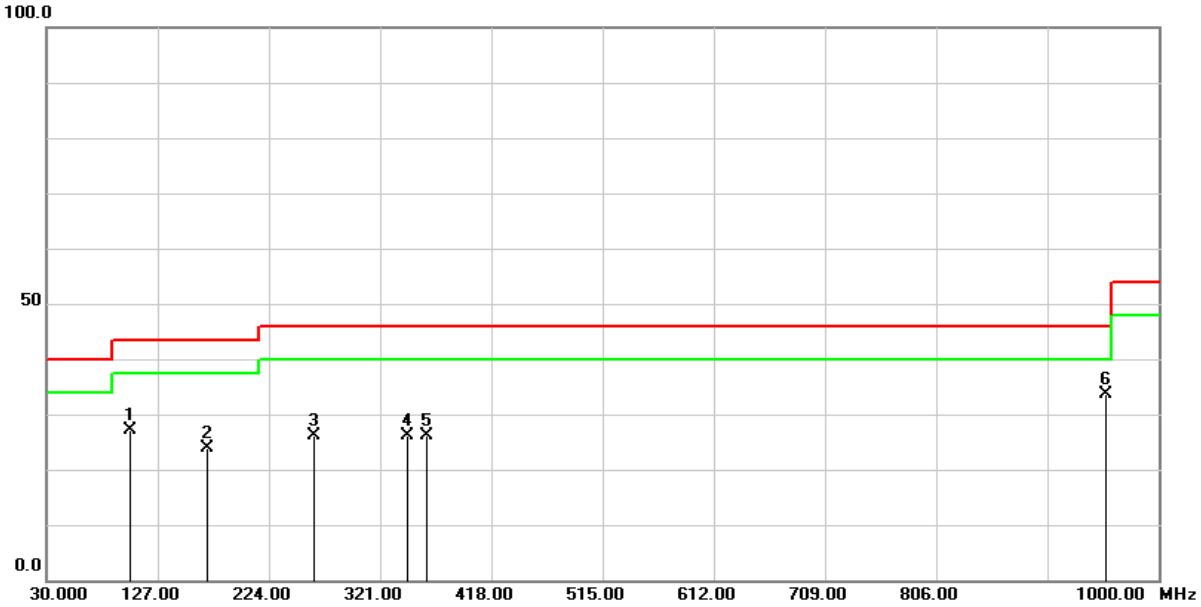
(2) Near-Field Result = Reading Level + Correct Factor

(3) Margin Level = Derived Value – Limit Value

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

Above 30MHz Data

Test Mode :	Mode 1: Transmit	Test Date :	2023/02/24
Test Frequency:	125 KHz	Temperature :	20.1 ℃
Polarization :	Horizontal	Relative Humidity :	43.1 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	102.7500	42.65	-15.52	27.13	43.50	-16.37	QP
2	169.6800	35.44	-11.55	23.89	43.50	-19.61	QP
3	263.7700	37.35	-11.26	26.09	46.00	-19.91	QP
4	345.2500	35.04	-8.82	26.22	46.00	-19.78	QP
5	361.7400	34.84	-8.66	26.18	46.00	-19.82	QP
6	954.4100	29.33	4.30	33.63	46.00	-12.37	QP

Remark：

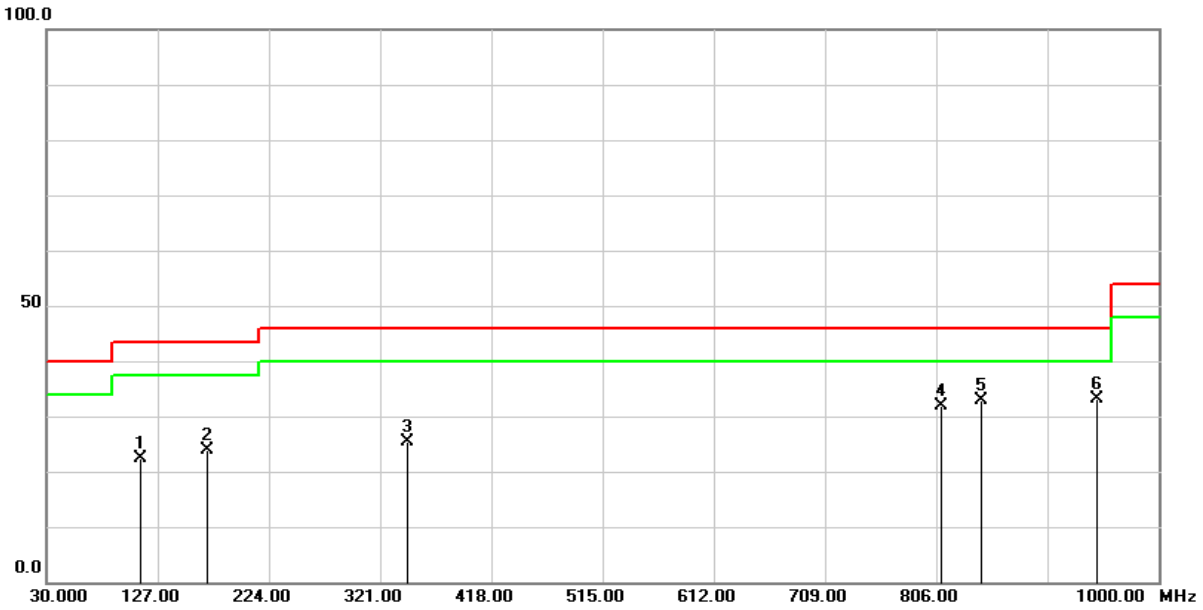
(1) Correction Factor = Antenna factor + Cable loss –Amplifier gain

(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	Test Date :	2023/02/24
Test Frequency:	125 KHz	Temperature :	20.1 ℃
Polarization :	Vertical	Relative Humidity :	43.1 %



No.	Frequency (MHz)	Reading (dBuV/m)	Correct Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	111.4800	36.56	-14.17	22.39	43.50	-21.11	QP
2	169.6800	35.51	-11.55	23.96	43.50	-19.54	QP
3	345.2500	34.31	-8.82	25.49	46.00	-20.51	QP
4	810.8500	30.01	1.82	31.83	46.00	-14.17	QP
5	845.7700	30.31	2.45	32.76	46.00	-13.24	QP
6	945.6800	28.88	4.15	33.03	46.00	-12.97	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

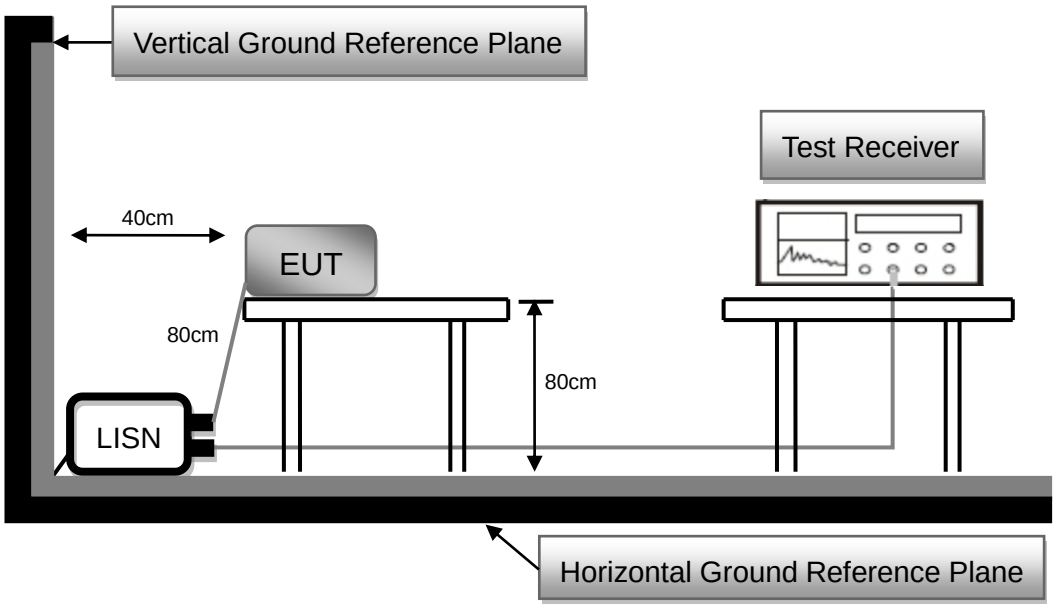
2.3 AC Conducted Emissions Measurement

2.3.1 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

2.3.2 Test Setup

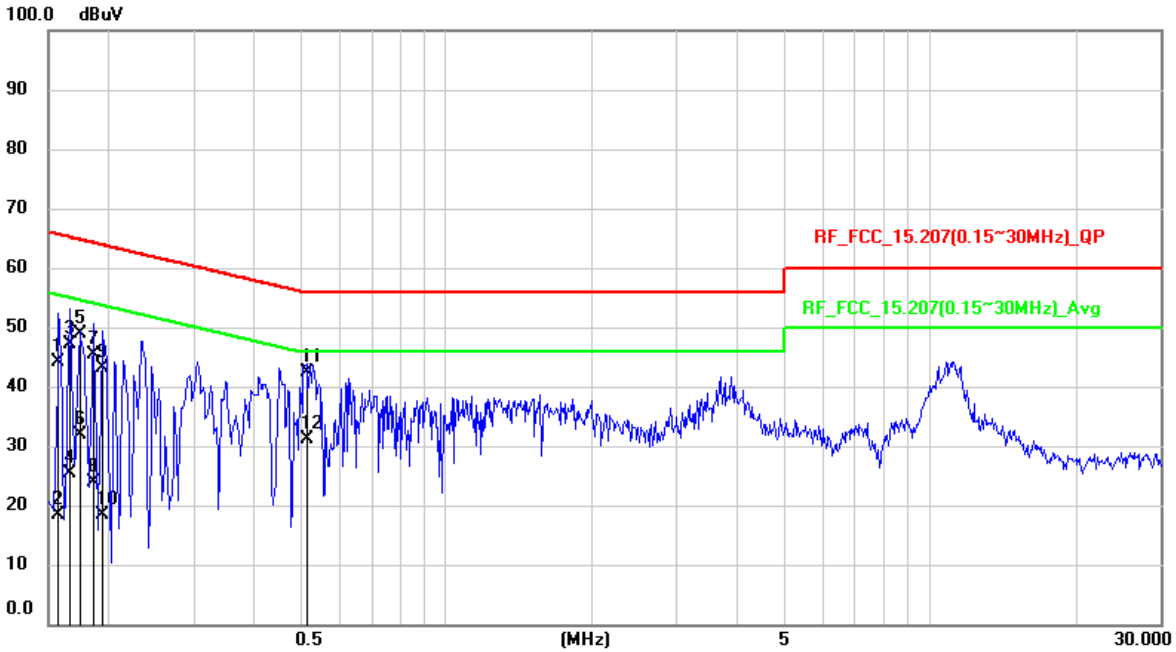


2.3.3 Test Procedure

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.

2.3.4 Test Result

Test Voltage :	120Vac, 60Hz	**Frequency Range:**	0.15-30 MHz
Test Mode :	Transmit	**6dB Bandwidth :**	9 kHz
Test Date :	2023/02/22	**Phase :**	L
Temperature :	24.1℃	**Humidity :**	51 %

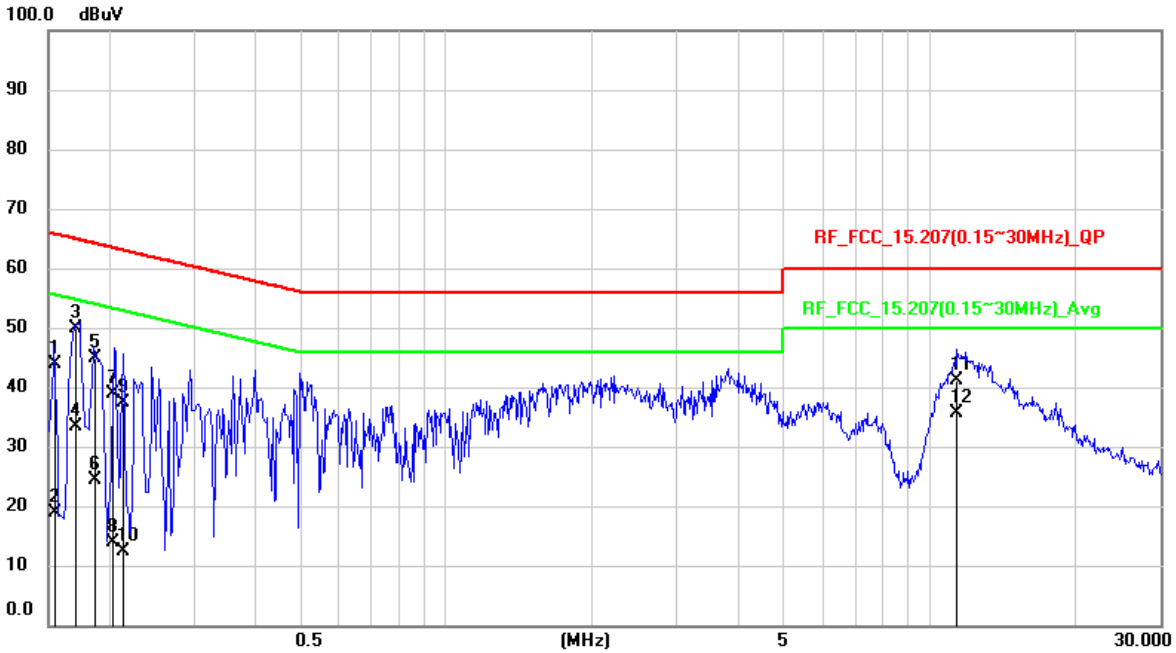


No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1567	34.23	9.83	44.06	65.64	-21.58	QP
2	0.1567	8.55	9.83	18.38	55.64	-37.26	AVG
3	0.1667	37.23	9.83	47.06	65.12	-18.06	QP
4	0.1667	15.44	9.83	25.27	55.12	-29.85	AVG
5	0.1733	39.08	9.83	48.91	64.8	-15.89	QP
6	0.1733	22.03	9.83	31.86	54.8	-22.94	AVG
7	0.1856	35.66	9.82	45.48	64.23	-18.75	QP
8	0.1856	13.99	9.82	23.81	54.23	-30.42	AVG
9	0.1942	33.43	9.82	43.25	63.85	-20.6	QP
10	0.1942	8.47	9.82	18.29	53.85	-35.56	AVG
11	0.5123	32.67	9.83	42.5	56	-13.5	QP
12	0.5123	21.38	9.83	31.21	46	-14.79	AVG

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

Test Voltage :	120Vac, 60Hz	Frequency Range:	0.15-30 MHz
Test Mode :	Transmit	6dB Bandwidth :	9 kHz
Test Date :	2023/02/22	Phase :	N
Temperature :	24.1℃	Humidity :	51 %



No.	Frequency (MHz)	Reading Level (dBuV)	Correct Factor (dB)	Measurement (dBuV)	Limit (dBuV)	Margin (dB)	Detector
1	0.1551	34.04	9.81	43.85	65.72	-21.87	QP
2	0.1551	9	9.81	18.81	55.72	-36.91	AVG
3	0.1707	40.04	9.81	49.85	64.93	-15.08	QP
4	0.1707	23.48	9.81	33.29	54.93	-21.64	AVG
5	0.1883	35.11	9.8	44.91	64.11	-19.2	QP
6	0.1883	14.53	9.8	24.33	54.11	-29.78	AVG
7	0.2031	29.05	9.8	38.85	63.48	-24.63	QP
8	0.2031	3.97	9.8	13.77	53.48	-39.71	AVG
9	0.2146	27.55	9.8	37.35	63.03	-25.68	QP
10	0.2146	2.48	9.8	12.28	53.03	-40.75	AVG
11	11.4265	31.07	10.04	41.11	60	-18.89	QP
12	11.4265	25.51	10.04	35.55	50	-14.45	AVG

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

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