

FCC 15.249 2.4GHz Report

for

Chungear Industrial Co., Ltd

12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan

**Product Name : Ceiling Fan Remote
Controller (Transmitter)**
Model Name : TR228A-A8106
FCC ID : KUJCE11101

**Prepared by: : AUDIX Technology Corporation,
EMC Department**



The test report is based on a single evaluation of one sample of the above-mentioned products. It does not imply an assessment of the whole production and does not permit the use of the test lab logo.

TABLE OF CONTENTS

Description	Page
TEST REPORT CERTIFICATION	3
1. REVISION RECORD OF TEST REPORT	4
2. SUMMARY OF TEST RESULTS	5
3. GENERAL INFORMATION	6
3.1. Description of Application.....	6
3.2. Description of EUT.....	7
3.3. Reference Test Guidance	7
3.4. Antenna Information.....	7
3.5. EUT Specifications Assessed in Current Report	7
3.6. Description of Key Components.....	7
3.7. Test Configuration	8
3.8. Tested Supporting System List.....	9
3.9. Setup Configuration.....	9
3.10. Operating Condition of EUT	9
3.11. Description of Test Facility	10
3.12. Measurement Uncertainty.....	11
4. MEASUREMENT EQUIPMENTLIST	12
4.1. Conducted Emission Measurement	12
4.2. Radiated Emission Measurement.....	13
5. CONDUCTED EMISSION MEASUREMENT	14
5.1. Block Diagram of Test Setup.....	14
5.2. Conducted Emission Limit	14
5.3. Test Procedure	14
5.4. Test Results.....	15
6. RADIATED EMISSION	16
6.1. Block Diagram of Test Setup.....	16
6.2. Radiated Emission Limits.....	17
6.3. Test Procedure	18
6.5. Measurement Result Explanation	20
6.6. Test Results.....	20
7. EMISSION BANDWIDTH MEASUREMENT	21
7.1. Block Diagram of Test Setup.....	21
7.2. Test Procedure	21
7.3. Test Results.....	21
8. DEVIATION TO TEST SPECIFICATIONS.....	22

APPENDIX A TEST PHOTOGRAPHS
APPENDIX B EUT PHOTOGRAPHS

TEST REPORT CERTIFICATION

Applicant : Chungear Industrial Co., Ltd
Manufacturer #1 : Chungear Industrial Co., Ltd
Manufacturer #2 : SATELLITE ELECTRONIC (ZHONGSHAN), LTD.
Manufacturer #3 : ZHONGSHAN AMITY ELECTRONIC LTD.,
EUT Description
(1) Product : Ceiling Fan Remote Controller (Transmitter)
(2) Model : TR228A-A8106
(3) Brand : N/A
(4) Power Rating : AC 120V/60Hz

Applicable Standards:

Title 47 CFR FCC Part 15 Subpart C

Audix Technology Corp. tested the equipment mentioned in accordance with the requirements set forth in the above standards. Test results indicate that the equipment tested is capable of demonstrating compliance with the requirements as documented within this report.

Audix Technology Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens and samples.

Date of Report: 2022. 05. 03

Reviewed by: Annie Yu (Annie Yu/Administrator)

Approved by: Johnny Hsueh (Johnny Hsueh/Section Manager)

1. REVISION RECORD OF TEST REPORT

Edition No	Issued Data	Revision Summary	Report Number
0	2022. 03. 30	Original Report	EM-F220226
A	2022. 05. 03	To evaluate full loading with conducted emissions and RSE (30 MHz to 1 GHz).	EM-F220226

2. SUMMARY OF TEST RESULTS

Rule	Description	Results
15.207	Conducted Emission (*)	PASS
15.205/ 15.209/ 15.249(a)	Radiated Band Edge and Radiated Spurious Emission (*) Fundamental Frequency	PASS
15.215	Emission Bandwidth	PASS
15.203	Antenna Requirement	PASS
Note: 1. The uncertainties value is not used in determining the result. 2. “*” The characteristics difference doesn’t change when make light loading or full loading with EUT. So we presented measured result with light loading for all test items.		

3. GENERAL INFORMATION

3.1. Description of Application

Applicant	Chungear Industrial Co., Ltd 12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan
Manufacturer #1	Chungear Industrial Co., Ltd 12 Jingke 8th Rd Nantun District Taichung 40852 Taiwan
Manufacturer #2	SATELLITE ELECTRONIC (ZHONGSHAN),, LTD. 8 CHUANG YE RD. TORCH DEVELOPMENT ZONE. ZHONGSHAN.GUANGDONG.528437 CHINA
Manufacturer #3	ZHONGSHAN AMITY ELECTRONIC LTD., NO.16,TORCH HI-TECH INDUSTRIAL DEVELOPMENT ZONE, ZHONGSHAN CITY GUANGDONG PROVINCE CHINA
Product	Ceiling Fan Remote Controller (Transmitter)
Model	TR228A-A8106

3.2. Description of EUT

Test Model	TR228A-A8106
Serial Number	N/A
Power Rating	AC 120V/60Hz
RF Features	2.4G
Transmit Type	1T1R
Sample Status	Production
Date of Receipt	2022. 01. 07
Date of Test	2022. 02. 24~ 04. 28
Interface Ports of EUT	None
Accessories Supplied	None

3.3. Reference Test Guidance

ANSI C63.10:2013

3.4. Antenna Information

No.	Antenna Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain (dBi)
1	---	---	PCB	2440	2.78dBi

3.5. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate
2.4G	2410-2425	3	FSK	500bps

Channel List	
Channel Number	Frequency (MHz)
01	2410
02	2420
03	2425

3.6. Description of Key Components

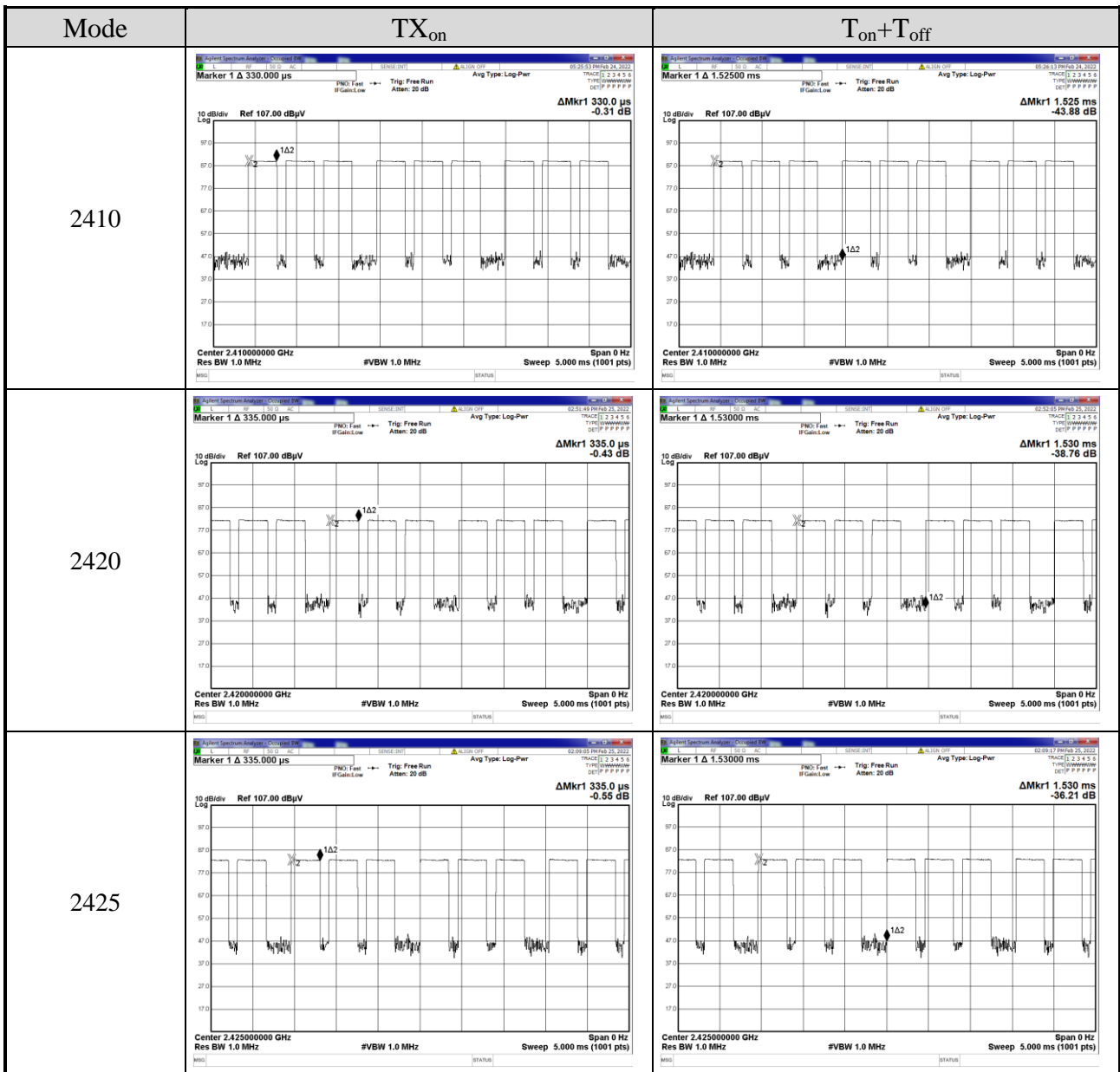
None

3.7. Test Configuration

Frequency (MHz)	TX _{on} (ms)	TX _{on+off} (ms)	1/ TX _{on} (kHz)	Duty Cycle Correction Factor (DCCF) (dB)
2410	0.990	1.525	0.649	-3.75
2420	1.005	1.530	0.657	-3.65
2425	1.005	1.530	0.657	-3.65

Note: Duty Cycle Correction Factor (DCCF)= 20log(TX_{on}/100ms)

“TX_{on+off}” means the period of the pulse train or 100ms if the pulse train length is greater than 100ms



Item		Mode	Test Channel
Radiated Test Case	Radiated Band Edge ^{Note1}	2.4G	01/03
	Radiated Spurious Emission (30MHz-1GHz) ^{Note1}	2.4G	01
	Radiated Spurious Emission (Above 1GHz) ^{Note1}	2.4G	01/02/03
	Fundamental Frequency	2.4G	01/02/03
	Occupied Bandwidth 99% Power	2.4G	01/02/03

Note : Mobile Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: Lie Side Stand

Portable Device, and 3 axis were assessed. The worst scenario for Radiated Spurious Emission as follow: Lie Side Stand

3.8. Tested Supporting System List

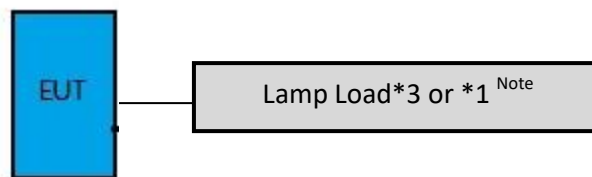
3.8.1. Support Peripheral Unit

No.	Product	Brand	Model No.	Serial No.	Approval
1.	Lamp Load (100W)*3	N/A	N/A	N/A	N/A
2.	Lamp Load (60W)*1	N/A	N/A	N/A	N/A

3.8.2. Cable Lists

No.	Cable Description Of The Above Support Units
1.	AC Power Cord : Unshielded, Detachable, 1.2m*3
2.	AC Power Cord : Unshielded, Detachable, 1.0m

3.9. Setup Configuration



Note: The Conducted Emission and Radiated Spurious Emission (30MHz-1GHz) were test with full loading and light loading, others were tested with light loading.

3.10. Operating Condition of EUT

To press the button of EUT is used for enabling EUT RF function under continues transmitting and choosing data rate/ channel.

3.11. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 491, Zhongfu Rd., Linkou Dist., New Taipei City 244, Taiwan Tel: +886-2-26092133 Fax: +886-2-26099303 Website : www.audixtech.com Contact e-mail: attemc_report@audixtech.com
Accreditations	The laboratory is accredited by following organizations under ISO/IEC 17025:2017 (1) NVLAP(USA) NVLAP Lab Code 200077-0 (2) TAF(Taiwan) No. 1724
Test Facilities	FCC OET Designation Number under APEC MRA by NCC is : TW1724 ISED CAB Identifier Number under APEC TEL MRA by NCC is TW1724 (1) No.8 Shielded Room (2) No.1 3m Semi Anechoic Chamber

3.12.Measurement Uncertainty

Test Items/Facilities		Frequency Range	Uncertainty	
Conduction Test		9kHz-150kHz	±3.7dB	
		150kHz-30MHz	±3.4dB	
Radiation Test	<input checked="" type="checkbox"/>	No.1 3m Semi Anechoic Chamber		
		30MHz-200MHz, 3m, Horizontal	±3.8dB	
		200MHz-1000MHz, 3m, Horizontal	±4.1dB	
		30MHz-200MHz, 3m, Vertical	±4.5dB	
		200MHz-1000MHz, 3m, Vertical	±4.5dB	
		1GHz-6GHz, 3m	±4.7dB	
		6GHz-18GHz, 3m	±4.1dB	
	18GHz-40GHz, 3m	±3.52dB		
	<input type="checkbox"/>	No.3 3m Semi Anechoic Chamber		
		30MHz-200MHz, 3m, Horizontal	±3.9dB	
		200MHz-1000MHz, 3m, Horizontal	±4.2dB	
		30MHz-200MHz, 3m, Vertical	±4.3dB	
		200MHz-1000MHz, 3m, Vertical	±4.5dB	
		<input type="checkbox"/>	No.4 3m Semi Anechoic Chamber	
			30MHz-200MHz, 3m, Horizontal	±4.1dB
	200MHz-1000MHz, 3m, Horizontal		±4.5dB	
	30MHz-200MHz, 3m, Vertical		±4.4dB	
	200MHz-1000MHz, 3m, Vertical		±4.8dB	
	1GHz-6GHz, 3m		±5.0dB	
	<input type="checkbox"/>	No.5 3m Semi Anechoic Chamber		
		30MHz-200MHz, 3m, Horizontal	±4.2dB	
		200MHz-1000MHz, 3m, Horizontal	±4.3dB	
		30MHz-200MHz, 3m, Vertical	±4.3dB	
		200MHz-1000MHz, 3m, Vertical	±4.7dB	
6GHz-18GHz, 3m		±4.5dB		

Remark : Uncertainty = $ku_c(y)$

Test Item	Uncertainty
Emission Bandwidth	±1kHz

4. MEASUREMENT EQUIPMENT LIST

4.1. Conducted Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Test Receiver	R&S	ESR3	101774	2022. 01. 11	1 Year
2.	A.M.N.	R&S	ENV432	101567	2021. 04. 21	1 Year
		R&S	ENV4200	100169	2021. 11. 04	1 Year
3.	L.I.S.N.	Kyoritsu	KNW-407	8-855-9	2021. 12. 19	1 Year
4.	Pulse Limiter	R&S	ESH3-Z2	100354	2021. 12. 23	1 Year
5.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.8 S/R	2022. 04. 14	1 Year
6.	Coaxial Cable	Yeida	RG/58AU	CE-08	2021. 09. 13	1 Year
7.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9010B-544	MY55460198	2022. 04. 08	1 Year
2.	Test Receiver	R&S	ESCI7	100923	2022. 03. 02	1 Year
3.	Amplifier	HP	8447D	2944A06305	2022. 01. 05	1 Year
4.	Microwave Amplifier	Keysight	83051A	MY53010042	2021. 07. 30	1 Year
5.	Microwave Amplifier	Agilent	8449B	3008A02678	2022. 02. 22	1 Year
6.	Microwave Amplifier	HP	8449B	3008A01284	2021. 05. 19	1 Year
7.	Loop Antenna	ETS LINDGREN	6512	00035867	2021. 09. 29	1 Year
8.	Bilog Antenna	TESEQ	CBL6112D	33821	2021. 07. 16	1 Year
9.	Double-Ridged Waveguide Horn	EMCO	3115	9112-3775	2021. 05. 12	1 Year
10.	Horn Antenna	COM-POWE R	AH-840	101092	2022. 01. 06	1 Year
11.	2.4GHz Notch Filter	K&L Microwave	7NSL10-2441 .5/E130.5-O/ O	2	2021 .07. 24	1 Year
12.	3GHz Notch Filter	Microwave	H3G018G1	484796	2021 .07. 24	1 Year
13.	Coaxial Cable	MIYAZAKI	5D2W	RE-11	2022. 01. 20	1 Year
14.	Coaxial Cable	HUBER+SU HNER	SUCOFLEX 106	RE-14	2022. 01. 20	1 Year
15.	Coaxial Cable	HUBER+SU HNER	SUCOFLEX 102	RE-30	2021. 05. 25	1 Year
16.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.3 3m A/C	2022. 04. 14	1 Year
17.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

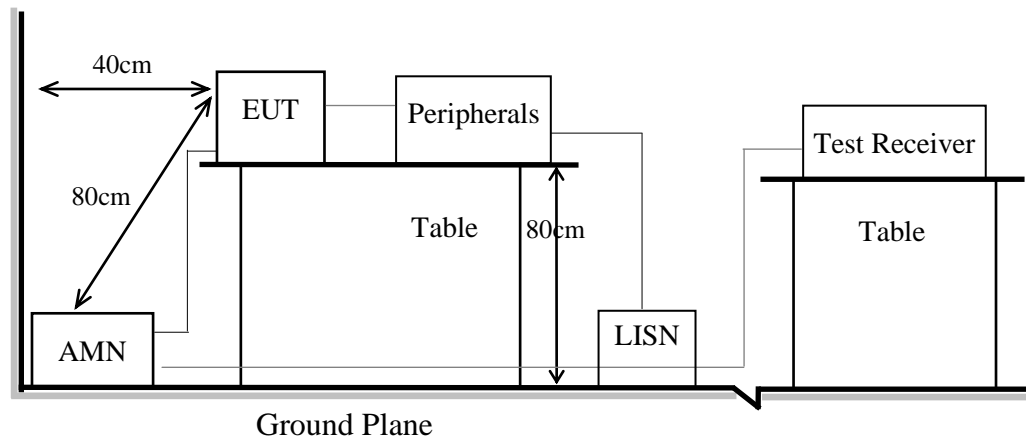
5. CONDUCTED EMISSION MEASUREMENT

5.1. Block Diagram of Test Setup

5.1.1. Block Diagram of EUT

Indicated as section 3.9

5.1.2. Shielded Room Setup Diagram



5.2. Conducted Emission Limit

Frequency	Conducted Limit	
	Quasi-Peak Level	Average Level
150kHz ~ 500kHz	66 ~ 56 dB μ V	56 ~ 46 dB μ V
500kHz ~ 5MHz	56 dB μ V	46 dB μ V
5MHz ~ 30MHz	60 dB μ V	50 dB μ V

Remark1.: If the average limit is met when using a Quasi-Peak detector, the measurement using the average detector is not required.

2.: The lower limit applies to the band edges.

5.3. Test Procedure

- 5.3.1. To set up the EUT as indicated in ANSI C63.10. The EUT was placed on the table which has 80 cm height to the ground and 40 cm distance to the conducting wall.
- 5.3.2. Power supplier of the EUT was connected to the AC mains through an Artificial Mains Network (A.M.N.).
- 5.3.3. The AC power supplies to all peripheral devices must be provided through line impedance stabilization network (L.I.S.N.).
- 5.3.4. Checking frequency range from 150kHz to 30 MHz and record the emission which does not have 20 dB below limit.

5.4. Test Results

Please refer to Appendix A.

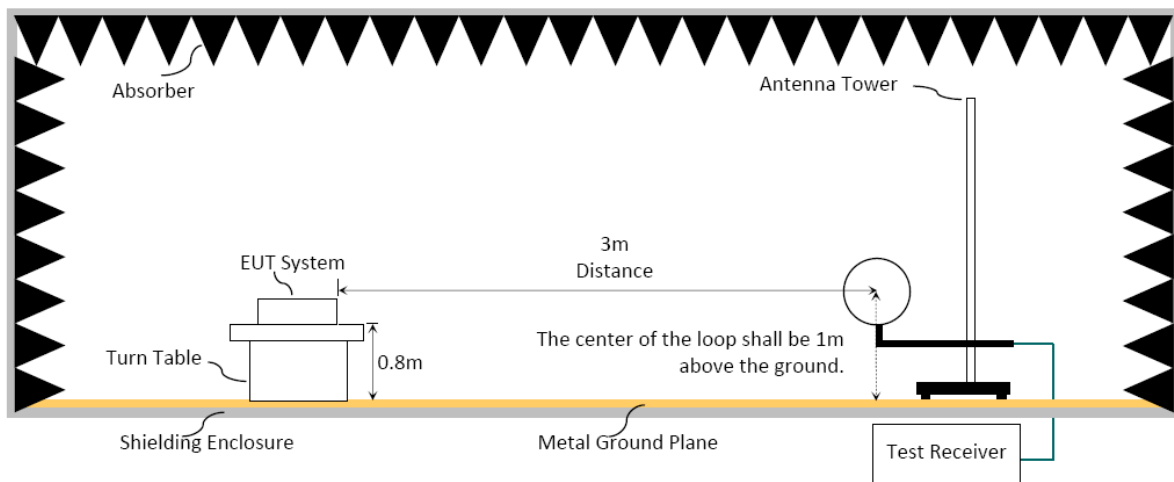
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

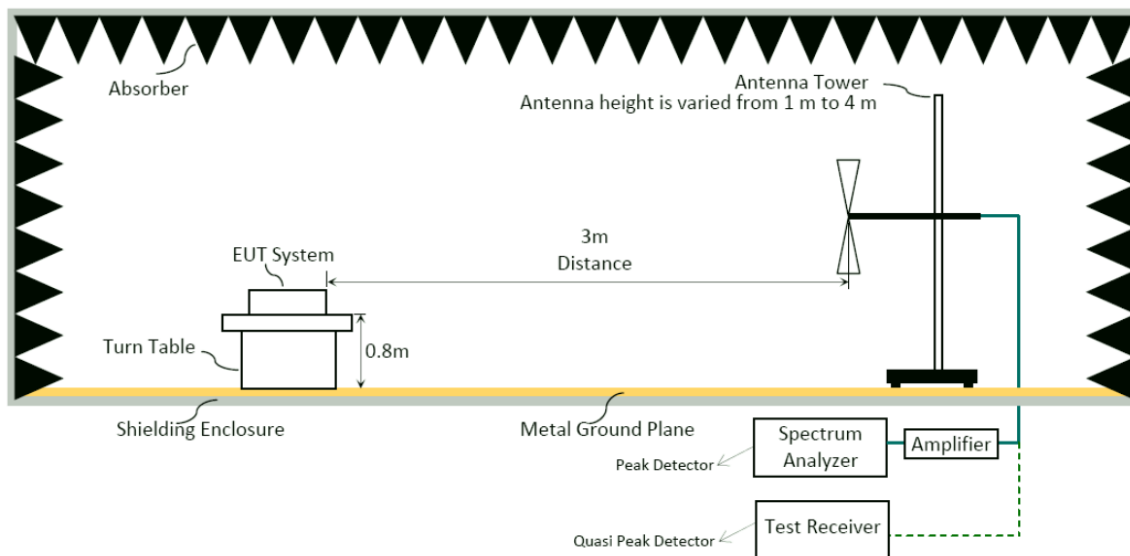
6.1.1. Block Diagram of EUT

Indicated as section 3.9

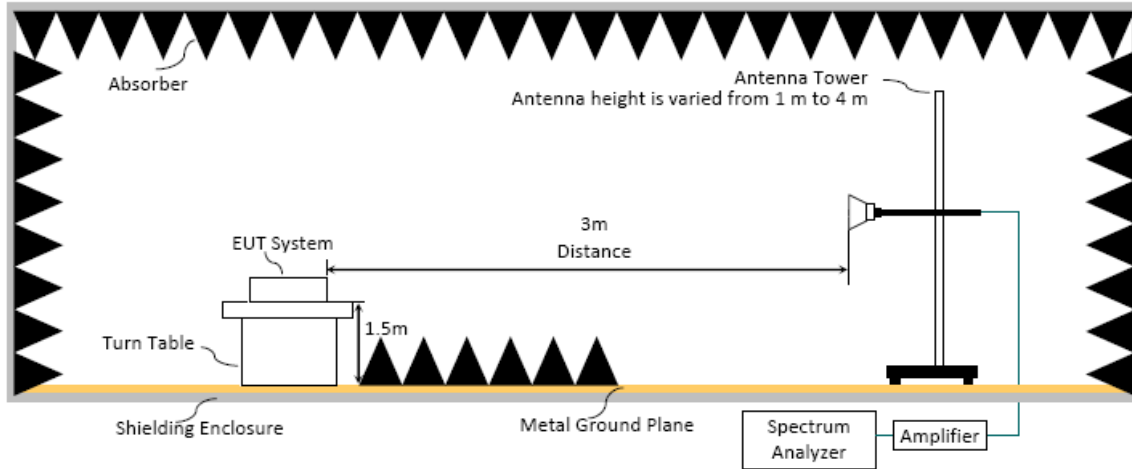
6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

6.2.1. General Limit

In any 100kHz bandwidth outside the frequency band, the radio frequency power produced by the intentional radiator shall be at least 20dB below that in the 100kHz bandwidth within the band that contains the highest level. In addition, radiated emissions which fall in restricted bands, as defined in FCC Section 15.205, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance(m)	Limits	
		dB μ V/m	μ V/m
0.009 - 0.490	300	67.6-20 log f(kHz)	2400/f kHz
0.490 - 1.705	30	87.6-20 log f(kHz)	24000/f kHz
1.705 - 30	30	29.5	30
30 - 88	3	40.0	100
88- 216	3	43.5	150
216- 960	3	46.0	200
Above 960	3	54.0	500
Above 1000	3	74.0 dB μ V/m (Peak) 54.0 dB μ V/m (Average)	

Remark : (1) dB μ V/m = 20 log (μ V/m)

- (2) The tighter limit applies to the edge between two frequency bands.
- (3) Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
- (4) Fundamental and emission fall within operation band are exempted from this section.
- (5) Pursuant to ANSI C63.10: 6.6.4.3, if the maximized peak measured value complies with the average limit, then it is unnecessary to perform an average measurement.

6.2.2. Limite for Fundamental & Harmonics Frequency

Fundamental Frequency	Field strength of fundamental		Field strength of harmonics	
	mV/m	dB μ V/m	μ V/m	dB μ V/m
902-928MHz	50	94(Quasi-Peak)	500	74 (Peak)
				54(Average)
2400-2483.5MHz	50	114 (Peak)	500	74 (Peak)
		94(Average)		54(Average)
5725-5875MHz	50	114 (Peak)	500	74 (Peak)
		94(Average)		54(Average)
24.0-24.25GHz	250	128 (Peak)	2500	88 (Peak)
		108(Average)		68(Average)

Remark: mV/m=1000 μ V/m; dB μ V/m = 20 log (μ V/m)

6.3. Test Procedure

Frequency Range 9kHz~30MHz:

The EUT setup on the turntable which has 80cm height to the ground. The turn table rotated 360 degrees and antenna fixed to 1 m to find the maximum emission level. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

- (1) RBW = 9kHz with peak and average detector.
- (2) Detector: average and peak (9kHz-490kHz)
 Q.P. (490kHz-30MHz)

Frequency Range 30MHz ~ 25GHz:

The EUT setup on the turntable which has 80 cm (for 30-1000MHz) and 1.5m (for above 1GHz) height to the ground. The turn table rotated 360 degrees and antenna varied from 1 m to 4 m to find the maximum emission level. Both horizontal and vertical polarization are required. In order to find the maximum emission, all of the interface cables were manipulated according to ANSI C63.10-2013 regulation.

Frequency below 1GHz:

Spectrum Analyzer is used for pre-testing with following setting:

- (1)RBW = 120kHz
- (2)VBW $\geq 3 \times$ RBW.
- (3)Detector = Peak.
- (4)Sweep time = auto.
- (5)Trace mode = max hold.
- (6)Allow sweeps to continue until the trace stabilizes.

Note 1: When peak-detected value is lower than limit that the measurement using the Q.P. detector is not required, otherwise using Q.P. for final measurement.

Note 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.

Frequency above 1GHz to 10th harmonic (up to 25 GHz):**Peak Detector:**

- (1)RBW = 1MHz for field strength of harmonics; 2MHz for field strength of fundamental
- (2)VBW $\geq 3 \times$ RBW.
- (3)Detector = Peak.
- (4)Sweep time = auto.
- (5)Trace mode = max hold.
- (6)Allow sweeps to continue until the trace stabilizes.

Note: When peak-detected value is lower than limit that the measurement using the average detector is not required, otherwise using average detector for final measurement.

Average Detector:**■ Option 1:**

- (1)RBW = 1MHz
- (2)VBW $\geq 1/ T$. (Duty Cycle < 98%, when duty cycle presented in section 3.7)

Modulation Type	VBW Setting (VBW $\geq 1/ T$)
2.4G	1kHz

- (3)VBW = 10Hz (Duty Cycle $\geq 98\%$, when duty cycle presented in section 3.7)
- (4)Detector = Peak.
- (5)Sweep time = auto.
- (6)Trace mode = max hold.
- (7)Allow sweeps to continue until the trace stabilizes.

■ Option 2:

Average Emission Level(dB μ V/m)= Peak Emission Level(dB μ V/m)+ D.C.C.F. (dB)

6.5. Measurement Result Explanation

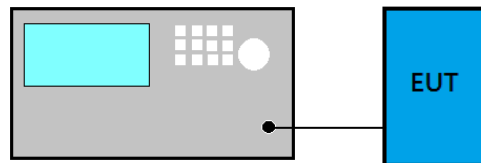
- Peak Emission Level(dB μ V/m)=Antenna Factor(dB/m) + Cable Loss (dB)– Preamp Gain (dB)+ Reading(dB μ V).
- Average Emission Level(dB μ V/m)= Antenna Factor(dB/m) + Cable Loss (dB)– Preamp Gain (dB)+ Reading(dB μ V).
- Average Emission Level(dB μ V/m)= Peak Emission Level(dB μ V/m)+ DCCF(dB) Duty Cycle Correction Factor (DCCF)(dB)= $20\log(\text{TX}_{\text{on}}/\text{TX}_{\text{on+off}})$ presented in section 3.7.
- ERP(dBm)= Peak Emission Level(dB μ V/m) -95.2dB-2.14dB

6.6. Test Results

Please refer to Appendix A.

7. EMISSION BANDWIDTH MEASUREMENT

7.1. Block Diagram of Test Setup



7.2. Test Procedure

- (1) Set RBW close to 1-5 % of 20dB BW.
- (2) Set $VBW \geq RBW$.
- (3) Detector = Peak.
- (4) Trace mode = max hold.
- (5) Sweep = auto couple.
- (6) Allow the trace to stabilize.
- (7) Setting channel bandwidth function x dB to -20dB to record the final bandwidth.

7.3. Test Results

Please refer to Appendix A

8. DEVIATION TO TEST SPECIFICATIONS

【NONE】



Audix Technology Corp.
No. 491, Zhongfu Rd., Linkou Dist.,
New Taipei City 244, Taiwan

APPENDIX A

Tel: +886 2 26099301
Fax: +886 2 26099303

APPDNDIX A

TEST DATA AND PLOTS

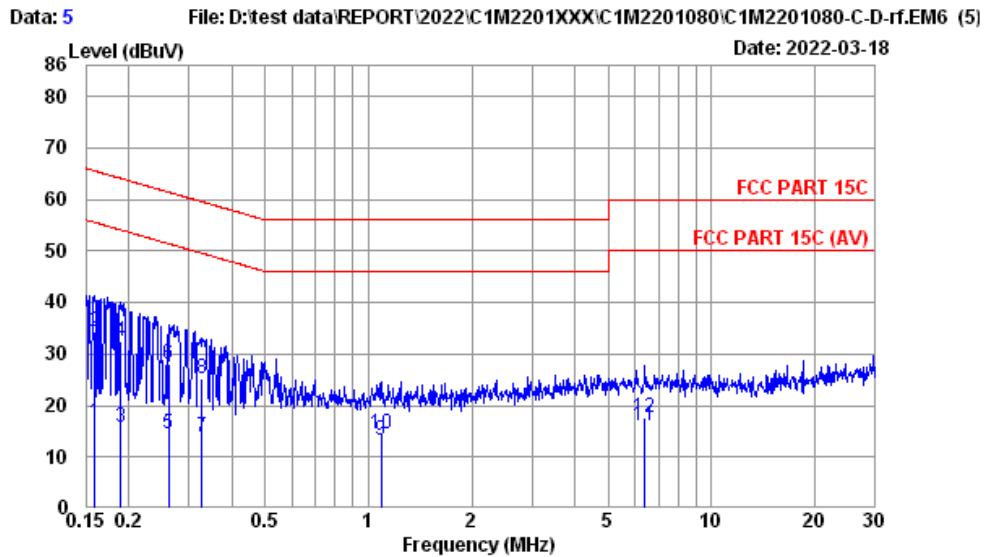
(Model: TR228A-A8106)

TABLE OF CONTENTS

A.1 CONDUCTED EMISSION	2
A.2 RADIATED EMISSION	6
A.2.1 Emissions Applied to General Requirement.....	6
A.2.2 Fundamental Frequency.....	15
A.3 EMISSION BANDWIDTH MEASUREMENT	18
A.3.1 Emission Bandwidth.....	18
A.3.2 Measurement Plots	18

A.1 CONDUCTED EMISSION

Test Date	2022/03/18	Temp./Hum.	25°C/63%
Test Voltage	AC 120V/60Hz	Test Mode	Light Loading



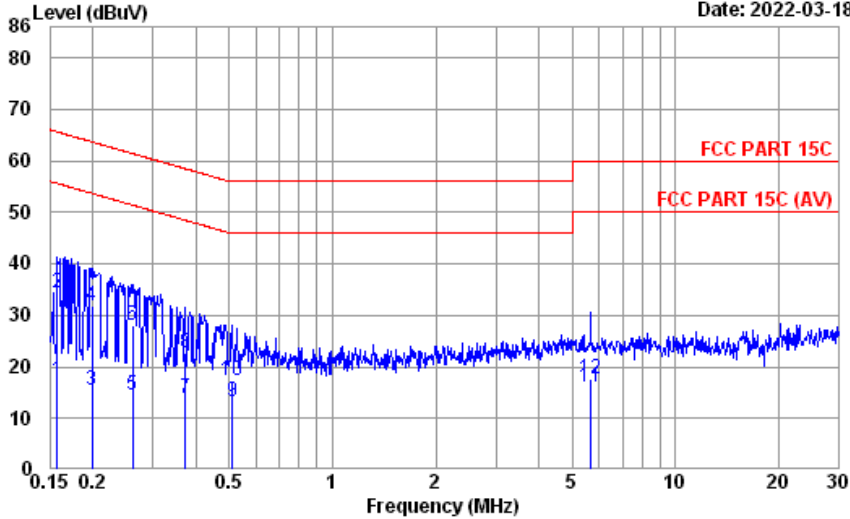
Site No. : No.8 Shielded Room Data No. : 5
 Instrument 1 : Receiver ESR3(774)
 Instrument 2 : EHV432 (567)(A)|CE-08|ESH3-Z2 (354)
 Limit : FCC PART 15C Phase : NEUTRAL
 Environment : 25°C / 63% Engineer : Chucky Chiu
 EUT Model : TR228A-A8106 Test Rating : 120Vac/60Hz
 Test Mode : operating

	Freq. (MHz)	AMI Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.159	10.41	0.03	9.85	-3.47	16.82	55.52	38.70	Average
2	0.159	10.41	0.03	9.85	13.93	34.22	65.52	31.30	QP
3	0.189	10.39	0.03	9.85	-4.56	15.71	54.06	38.35	Average
4	0.189	10.39	0.03	9.85	12.14	32.41	64.06	31.65	QP
5	0.262	10.38	0.03	9.85	-5.83	14.43	51.38	36.95	Average
6	0.262	10.38	0.03	9.85	7.90	28.16	61.38	33.22	QP
7	0.327	10.38	0.03	9.85	-6.51	13.75	49.53	35.78	Average
8	0.327	10.38	0.03	9.85	4.84	25.10	59.53	34.43	QP
9	1.088	10.38	0.04	9.85	-7.07	13.20	46.00	32.80	Average
10	1.088	10.38	0.04	9.85	-5.67	14.60	56.00	41.40	QP
11	6.386	10.57	0.11	9.87	-4.37	16.18	50.00	33.82	Average
12	6.386	10.57	0.11	9.87	-2.88	17.67	60.00	42.33	QP

Remarks: 1. Emission Level= AMI Factor + Cable Loss + Pulse Att. + Reading.
 2. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

Test Date	2022/03/18	Temp./Hum.	25°C/63%
Test Voltage	AC 120V/60Hz	Test Mode	Light Loading

Data: 4 File: D:\test data\REPORT\2022\C1M2201XXX\C1M2201080\C1M2201080-C-D-rf.EM6 (5) Date: 2022-03-18

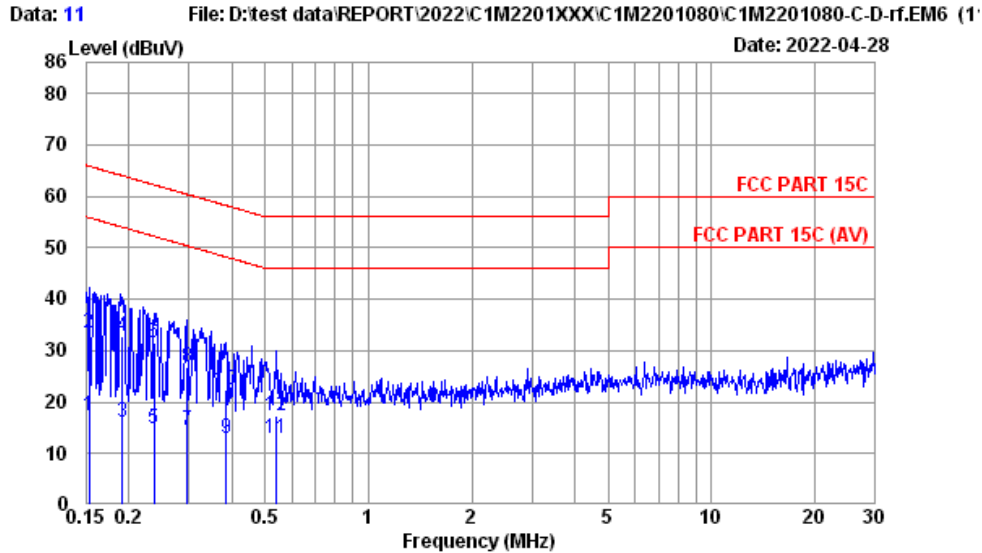


Site No. : No.8 Shielded Room Data No. : 4
 Instrument 1 : Receiver ESR3(774)
 Instrument 2 : EHV432 (567)(A)|CE-08|ESH3-Z2 (354)
 Limit : FCC PART 15C Phase : LINE
 Environment : 25°C / 63% Engineer : Chucky Chiu
 EUT Model : TR228A-A8106 Test Rating : 120Vac/60Hz
 Test Mode : operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBμV)	Emission Level (dBμV)	Limits (dBμV)	Margin (dB)	Remark
1	0.157	10.40	0.03	9.85	-3.01	17.27	55.60	38.33	Average
2	0.157	10.40	0.03	9.85	13.94	34.22	65.60	31.38	QP
3	0.199	10.39	0.03	9.85	-4.77	15.50	53.67	38.17	Average
4	0.199	10.39	0.03	9.85	11.49	31.76	63.67	31.91	QP
5	0.262	10.38	0.03	9.85	-5.64	14.62	51.38	36.76	Average
6	0.262	10.38	0.03	9.85	7.65	27.91	61.38	33.47	QP
7	0.373	10.37	0.03	9.85	-6.44	13.81	48.43	34.62	Average
8	0.373	10.37	0.03	9.85	2.46	22.71	58.43	35.72	QP
9	0.510	10.37	0.03	9.85	-7.10	13.15	46.00	32.85	Average
10	0.510	10.37	0.03	9.85	-2.84	17.41	56.00	38.59	QP
11	5.653	10.47	0.11	9.87	-4.52	15.93	50.00	34.07	Average
12	5.653	10.47	0.11	9.87	-2.84	17.61	60.00	42.39	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
 2. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

Test Date	2022/04/28	Temp./Hum.	28°C/51%
Test Voltage	AC 120V/60Hz	Test Mode	Full Loading



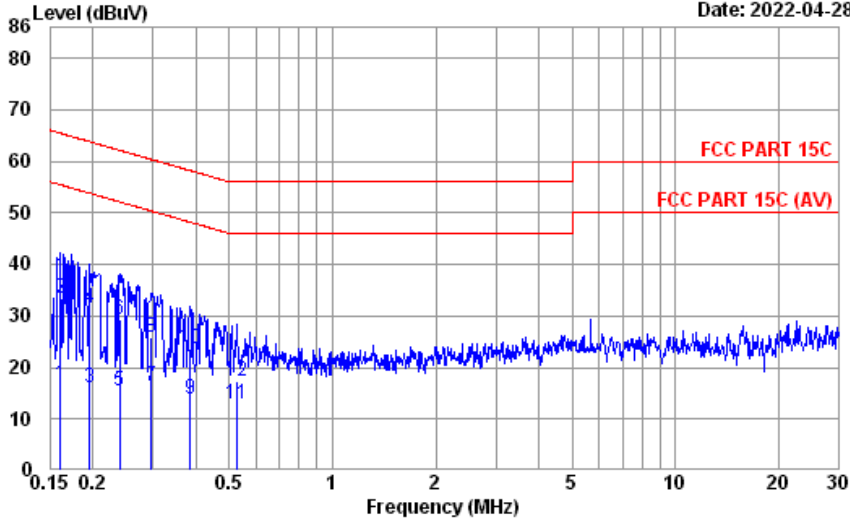
Site No.	: No.8 Shielded Room	Data No.	: 11
Instrument 1	: Receiver ESR3(774)		
Instrument 2	: EHV4200 (169)(A) CE-08 ESH3-Z2 (354)		
Limit	: FCC PART 15C	Phase	: NEUTRAL
Environment	: 28°C / 51%	Engineer	: Chucky Chiu
EUT Model	: TR228A-A8106	Test Rating	: 120Vac/60Hz
Test Mode	: operating		

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.153	10.64	0.03	9.85	-3.34	17.18	55.82	38.64	Average
2	0.153	10.64	0.03	9.85	12.92	33.44	65.82	32.38	QP
3	0.191	10.58	0.03	9.85	-4.38	16.08	53.98	37.90	Average
4	0.191	10.58	0.03	9.85	12.19	32.65	63.98	31.33	QP
5	0.237	10.54	0.03	9.85	-5.73	14.69	52.22	37.53	Average
6	0.237	10.54	0.03	9.85	11.09	31.51	62.22	30.71	QP
7	0.296	10.50	0.03	9.85	-5.93	14.45	50.37	35.92	Average
8	0.296	10.50	0.03	9.85	6.30	26.68	60.37	33.69	QP
9	0.385	10.45	0.03	9.85	-7.48	12.85	48.17	35.32	Average
10	0.385	10.45	0.03	9.85	2.18	22.51	58.17	35.66	QP
11	0.538	10.43	0.03	9.85	-7.54	12.77	46.00	33.23	Average
12	0.538	10.43	0.03	9.85	-2.96	17.35	56.00	38.65	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
 2. If the average limit is met when using a quasi-peak detector, the EUT shall be deemed to meet both limits and measurement with average detector is unnecessary.

Test Date	2022/04/28	Temp./Hum.	28°C/51%
Test Voltage	AC 120V/60Hz	Test Mode	Full Loading

Data: 10 File: D:\test data\REPORT\2022\C1M2201XXX\C1M2201080\C1M2201080-C-D-rf.EM6 (1' Date: 2022-04-28



Site No. : No.8 Shielded Room Data No. : 10
 Instrument 1 : Receiver ESR3(774)
 Instrument 2 : EHV4200 (169)(A)|CE-08|ESH3-Z2 (354)
 Limit : FCC PART 15C Phase : LINE
 Environment : 28°C / 51% Engineer : Chucky Chiu
 EUT Model : TR228A-A8106 Test Rating : 120Vac/60Hz
 Test Mode : operating

	Freq. (MHz)	AMN Factor (dB)	Cable Loss (dB)	Pulse Att. (dB)	Reading (dBµV)	Emission Level (dBµV)	Limits (dBµV)	Margin (dB)	Remark
1	0.161	10.59	0.03	9.85	-3.64	16.83	55.43	38.60	Average
2	0.161	10.59	0.03	9.85	12.85	33.32	65.43	32.11	QP
3	0.195	10.54	0.03	9.85	-4.28	16.14	53.80	37.66	Average
4	0.195	10.54	0.03	9.85	10.97	31.39	63.80	32.41	QP
5	0.239	10.51	0.03	9.85	-5.00	15.39	52.13	36.74	Average
6	0.239	10.51	0.03	9.85	8.78	29.17	62.13	32.96	QP
7	0.297	10.47	0.03	9.85	-3.93	16.42	50.32	33.90	Average
8	0.297	10.47	0.03	9.85	5.56	25.91	60.32	34.41	QP
9	0.385	10.43	0.03	9.85	-6.49	13.82	48.17	34.35	Average
10	0.385	10.43	0.03	9.85	3.34	23.65	58.17	34.52	QP
11	0.524	10.41	0.03	9.85	-7.24	13.05	46.00	32.95	Average
12	0.524	10.41	0.03	9.85	-2.84	17.45	56.00	38.55	QP

Remarks: 1. Emission Level= AMN Factor + Cable Loss + Pulse Att. + Reading.
 2. If the average limit is met when using a quasi-peak detector,
 the EUT shall be deemed to meet both limits and measurement
 with average detector is unnecessary.

A.2 RADIATED EMISSION

Test Date	2022/02/24 ~ 04/25	Temp./Hum.	17 ~ 23°C/65%
Test Voltage	AC 120V 60Hz (Via AC Adapter)	Tested By	Hua Wu

A.2.1 Emissions Applied to General Requirement

A.2.1.1 Frequency 9kHz~30MHz

The emissions (9kHz~30MHz) not reported for there is no emission be found.

A.2.1.2 Frequency Below 1GHz

Mode	2.4G	Frequency	TX 2410MHz
Test Mode	Light Loading		

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
303.54	19.16	4.36	25.72	32.05	29.85	46.00	16.15	Peak
385.02	21.09	5.38	26.41	28.47	28.53	46.00	17.47	Peak
496.57	23.06	6.40	27.14	29.06	31.38	46.00	14.62	Peak
540.22	23.61	6.57	27.28	30.78	33.68	46.00	12.32	Peak
632.37	24.46	6.94	27.44	29.04	33.00	46.00	13.00	Peak
742.95	25.30	7.51	27.40	29.29	34.70	46.00	11.30	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
303.54	19.16	4.36	25.72	28.61	26.41	46.00	19.59	Peak
418.00	21.73	5.71	26.63	29.85	30.66	46.00	15.34	Peak
482.99	22.84	6.29	27.06	29.54	31.61	46.00	14.39	Peak
540.22	23.61	6.57	27.28	30.94	33.84	46.00	12.16	Peak
667.29	24.64	7.12	27.45	29.56	33.87	46.00	12.13	Peak
818.61	26.01	7.94	27.27	29.85	36.53	46.00	9.47	Peak

Mode	2.4G	Frequency	TX 2410MHz
Test Mode	Full Loading		

Antenna at Horizontal Polarization

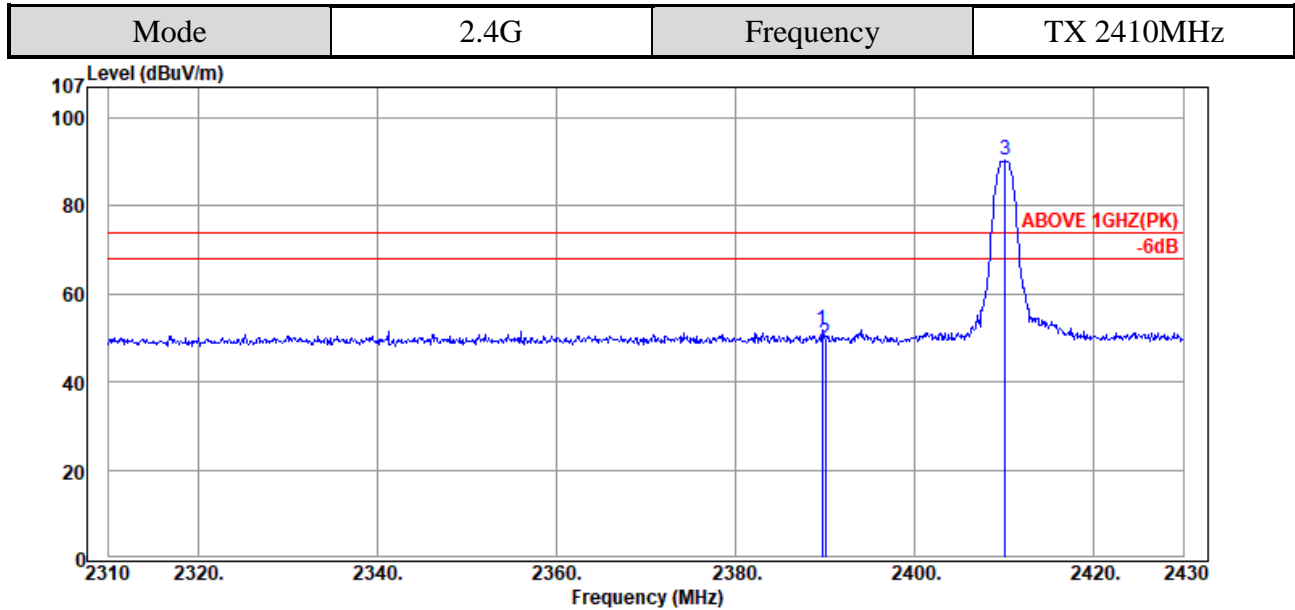
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Reading Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
303.540	19.16	4.74	25.64	26.83	25.09	46.00	20.91	Peak
385.020	21.09	5.76	26.33	25.40	25.92	46.00	20.08	Peak
496.570	23.06	6.73	27.10	26.78	29.47	46.00	16.53	Peak
540.220	23.61	6.90	27.24	30.18	33.45	46.00	12.55	Peak
632.370	24.46	7.28	27.41	27.90	32.23	46.00	13.77	Peak
742.950	25.30	7.89	27.36	26.93	32.76	46.00	13.24	Peak

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Reading Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
303.540	19.16	4.74	25.64	25.93	24.19	46.00	21.81	Peak
418.000	21.73	6.09	26.56	25.93	27.19	46.00	18.81	Peak
482.990	22.84	6.63	27.01	27.05	29.51	46.00	16.49	Peak
540.220	23.61	6.90	27.24	30.33	33.60	46.00	12.40	Peak
667.290	24.64	7.47	27.42	26.88	31.57	46.00	14.43	Peak
818.610	26.01	8.32	27.22	26.86	33.97	46.00	12.03	Peak

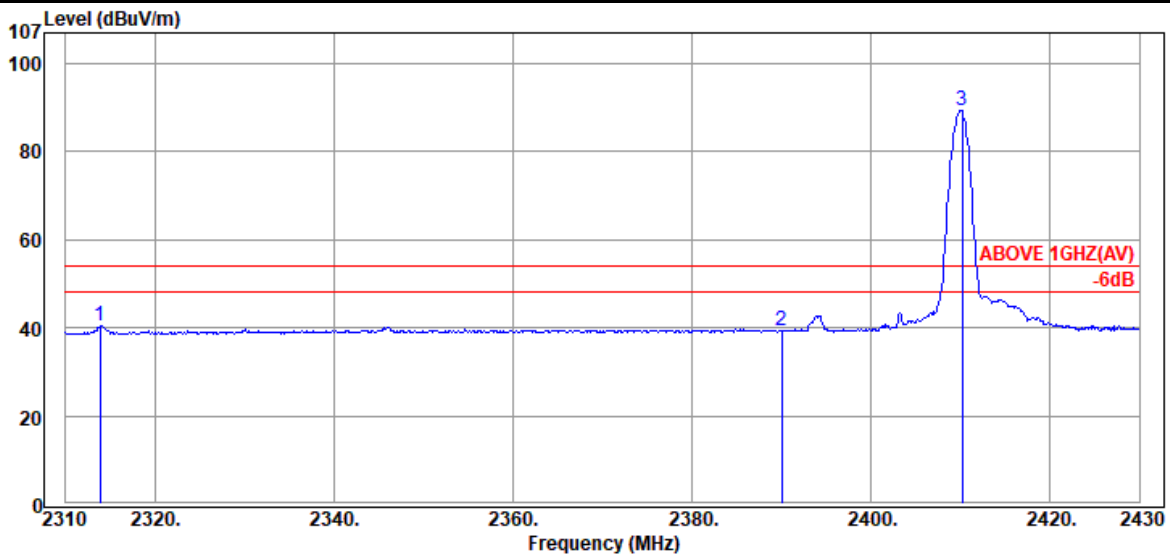
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

Band Edge:



Antenna at Horizontal Polarization

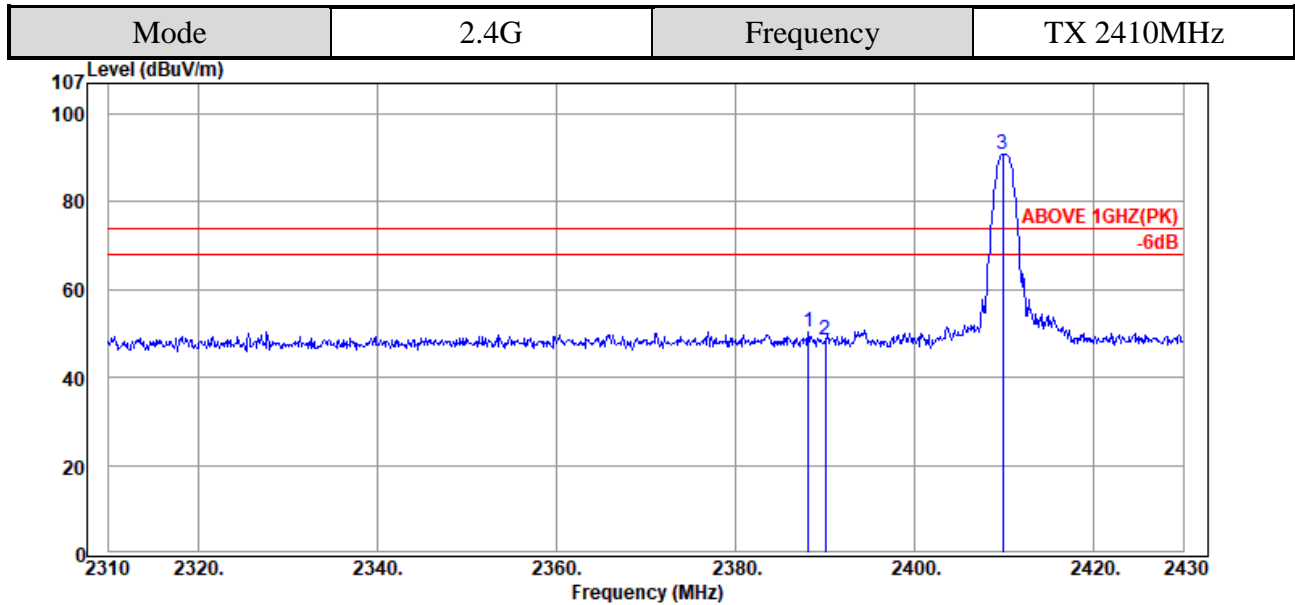
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2389.68	28.20	5.72	34.53	52.40	51.79	74.00	22.21	Peak
2390.04	28.20	5.72	34.54	49.56	48.94	74.00	25.06	Peak
@ 2410.08	28.23	5.75	34.54	90.84	90.28	---	---	Peak



Antenna at Horizontal Polarization

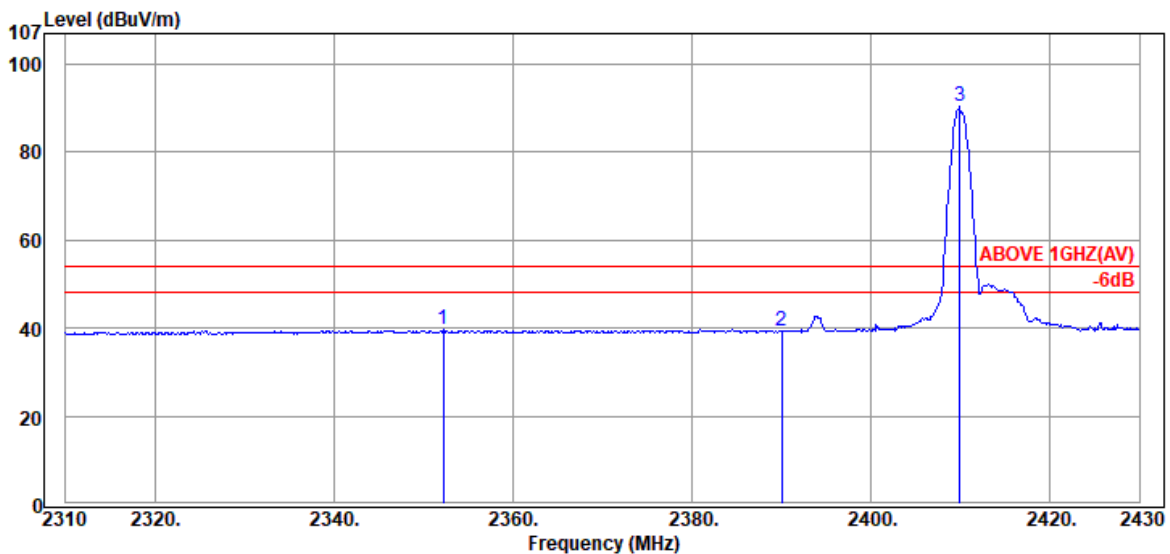
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2313.84	27.98	5.60	34.52	41.39	40.45	54.00	13.55	Average
2390.04	28.20	5.72	34.54	39.85	39.23	54.00	14.77	Average
@ 2410.20	28.23	5.75	34.54	89.91	89.35	---	---	Average

Remark: The “@” means fundamental frequency, it is ignored in this section.



Antenna at Vertical Polarization

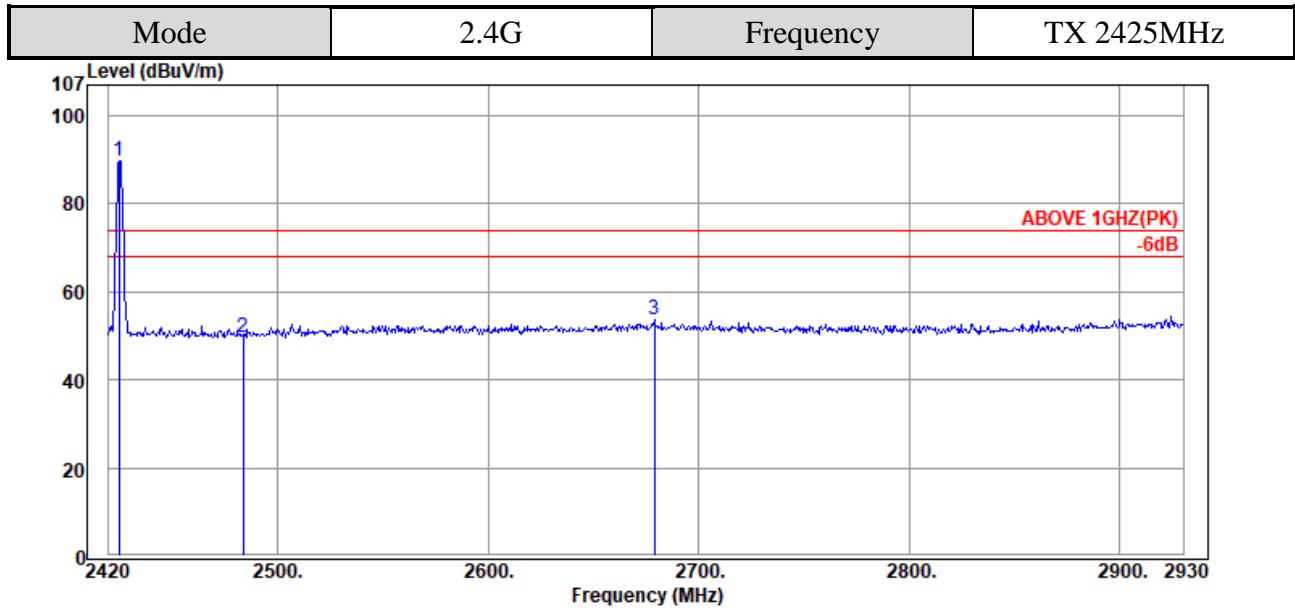
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2388.12	28.20	5.72	34.53	50.96	50.35	74.00	23.65	Peak
2390.04	28.20	5.72	34.54	49.02	48.40	74.00	25.60	Peak
@ 2409.84	28.23	5.75	34.54	91.41	90.85	---	---	Peak



Antenna at Vertical Polarization

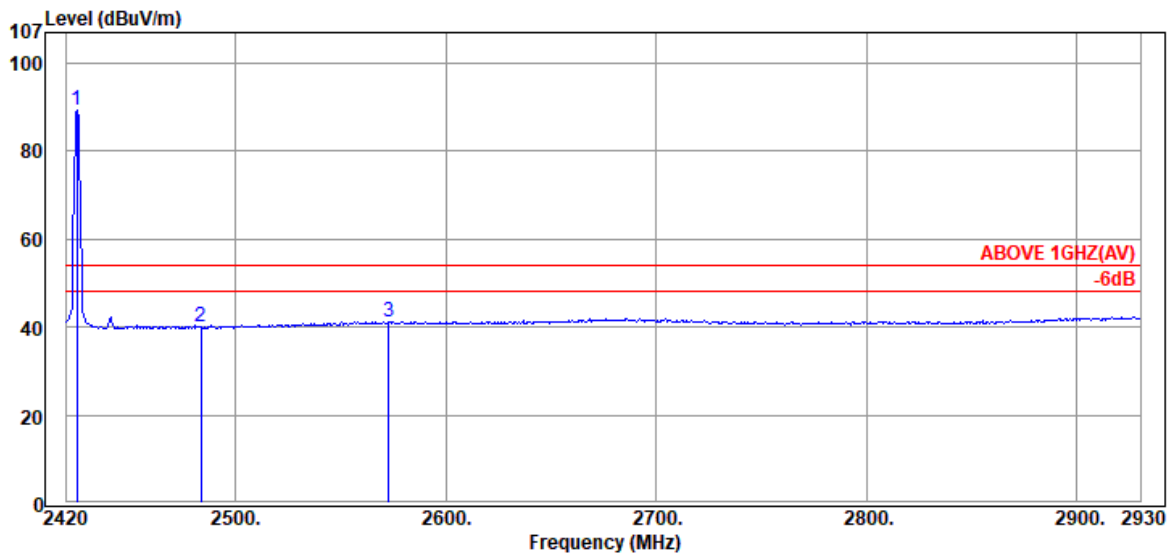
Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2352.24	28.20	5.66	34.53	40.23	39.56	54.00	14.44	Average
2390.04	28.20	5.72	34.54	39.92	39.30	54.00	14.70	Average
@ 2409.96	28.23	5.75	34.54	90.96	90.40	---	---	Average

Remark: The “@” means fundamental frequency, it is ignored in this section.



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2425.10	28.29	6.10	34.54	89.88	89.73	---	---	Peak
2483.75	28.47	6.18	34.55	49.55	49.65	74.00	24.35	Peak
2679.08	28.96	6.45	34.60	52.72	53.53	74.00	20.47	Peak

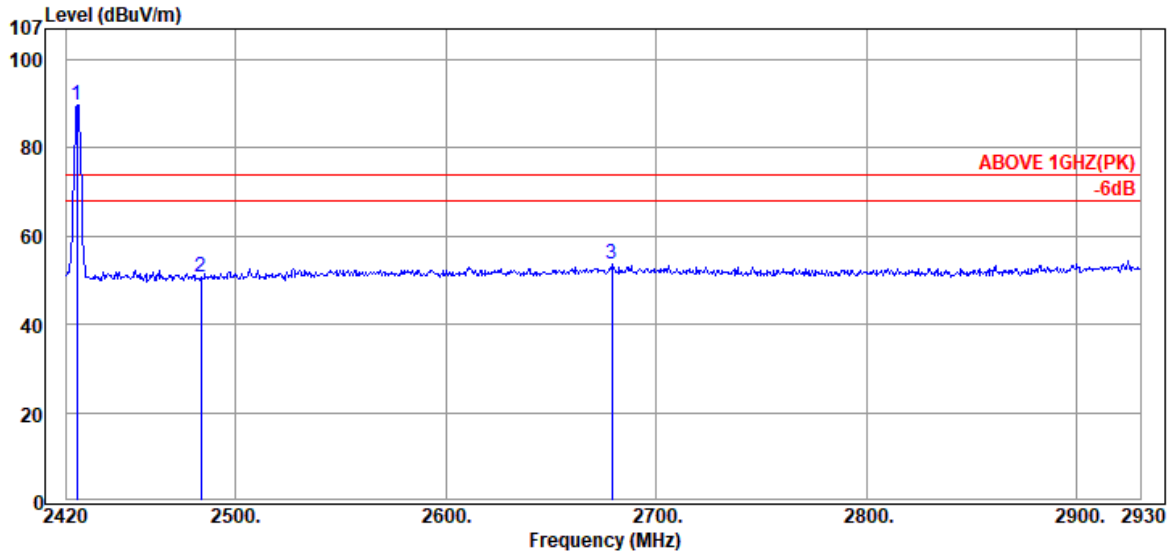


Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2425.10	28.29	6.10	34.54	89.42	89.27	---	---	Average
2483.75	28.47	6.18	34.55	39.87	39.97	54.00	14.03	Average
2573.00	28.79	6.32	34.58	40.75	41.28	54.00	12.72	Average

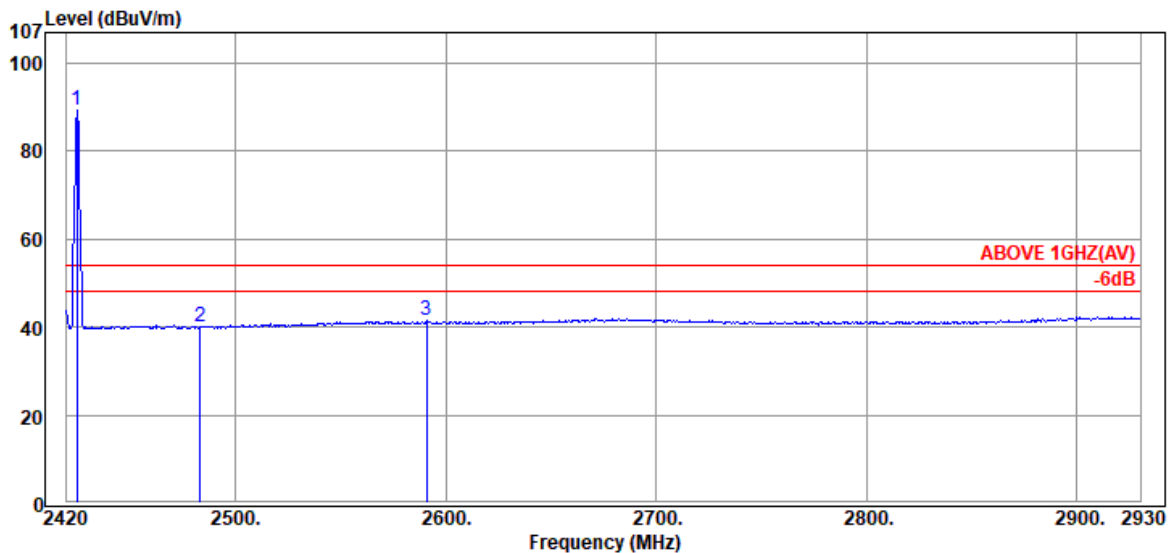
Remark: The “@” means fundamental frequency, it is ignored in this section.

Mode	2.4G	Frequency	TX 2425MHz
------	------	-----------	------------



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2425.10	28.29	6.10	34.54	89.92	89.77	---	---	Peak
2483.75	28.47	6.18	34.55	50.75	50.85	74.00	23.15	Peak
2679.08	28.96	6.45	34.60	52.72	53.53	74.00	20.47	Peak



Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
@ 2425.10	28.29	6.10	34.54	89.35	89.20	---	---	Average
2483.50	28.47	6.18	34.55	39.82	39.92	54.00	14.08	Average
2590.85	28.84	6.34	34.58	40.80	41.40	54.00	12.60	Average

Remark: The “@” means fundamental frequency, it is ignored in this section.

A.2.1.3 Frequency Above 1GHz

Mode	2.4G	Frequency	TX 2410MHz
------	------	-----------	------------

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
4820.000	33.13	8.55	34.44	50.08	57.32	74.00	16.68	Peak

Emission Frequency (MHz)	Peak Emission Level (dB μ V/m)	DCCF (dB)	Average Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
4820.00	57.32	-3.75	53.57	54.00	0.43	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dB μ V)	Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Detector
4820.000	33.13	8.55	34.44	50.46	57.70	74.00	16.30	Peak

Emission Frequency (MHz)	Peak Emission Level (dB μ V/m)	DCCF (dB)	Average Emission Level (dB μ V/m)	Limits (dB μ V/m)	Margin (dB)	Remark
4820.00	57.70	-3.75	53.95	54.00	0.05	Average

Mode	2.4G	Frequency	TX 2420MHz
------	------	-----------	------------

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4840.000	33.20	8.70	34.43	40.57	48.04	74.00	25.96	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4840.00	48.04	-3.65	44.39	54.00	9.61	Average

Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4840.000	33.20	8.70	34.43	40.76	48.23	74.00	25.77	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4840.00	48.23	-3.65	44.58	54.00	9.42	Average

Mode	2.4G	Frequency	TX 2425MHz
------	------	-----------	------------

Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4850.000	33.20	8.59	34.43	50.08	57.44	74.00	16.56	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4850.00	57.44	-3.65	53.79	54.00	0.21	Average

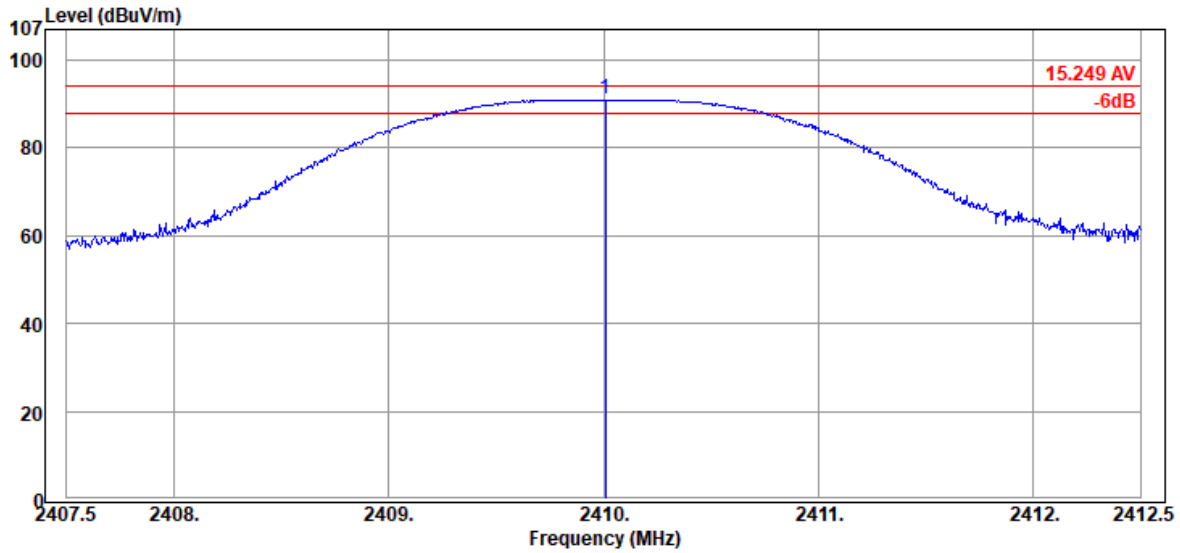
Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
4850.000	33.20	8.59	34.43	50.22	57.58	74.00	16.42	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
4850.00	57.58	-3.65	53.93	54.00	0.07	Average

A.2.2 Fundamental Frequency

Mode	2.4G	Frequency	TX 2410MHz
------	------	-----------	------------



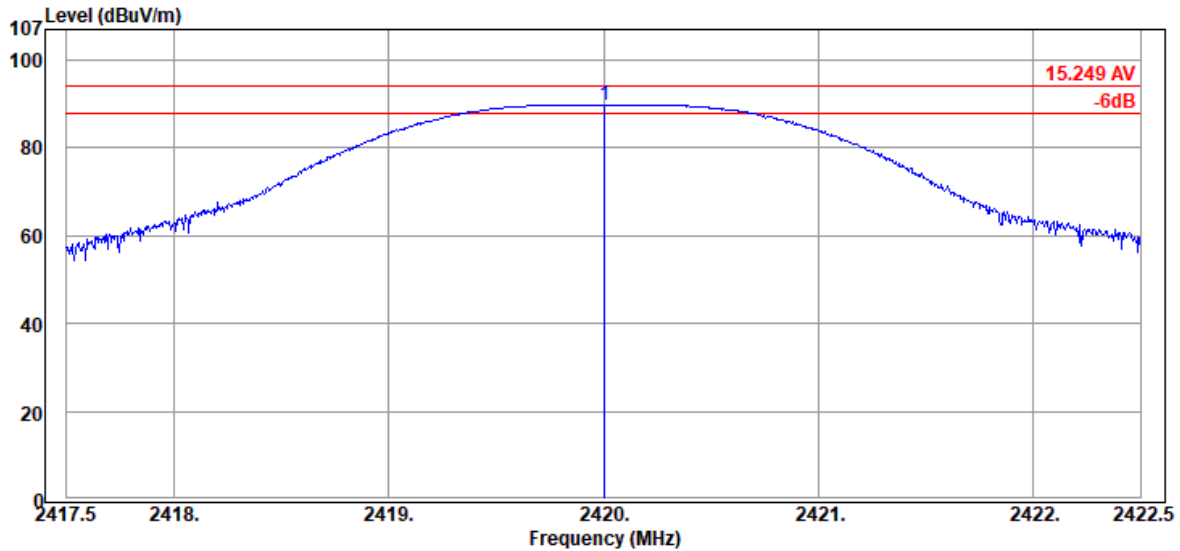
Antenna at Vertical Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBUV/m)	Limits (dBUV/m)	Margin (dB)	Detector
2410.01	28.23	6.07	34.54	91.47	91.23	114.0	22.77	Peak

Emission Frequency (MHz)	Peak Emission Level (dBUV/m)	DCCF (dB)	Average Emission Level (dBUV/m)	Limits (dBUV/m)	Margin (dB)	Remark
2410.01	91.23	-3.75	87.48	94.0	6.52	Average

Remark: Vertical is the strongest polarization and peak value has complied with average limit, so vertical won't be listed in test report.

Mode	2.4G	Frequency	TX 2420MHz
------	------	-----------	------------



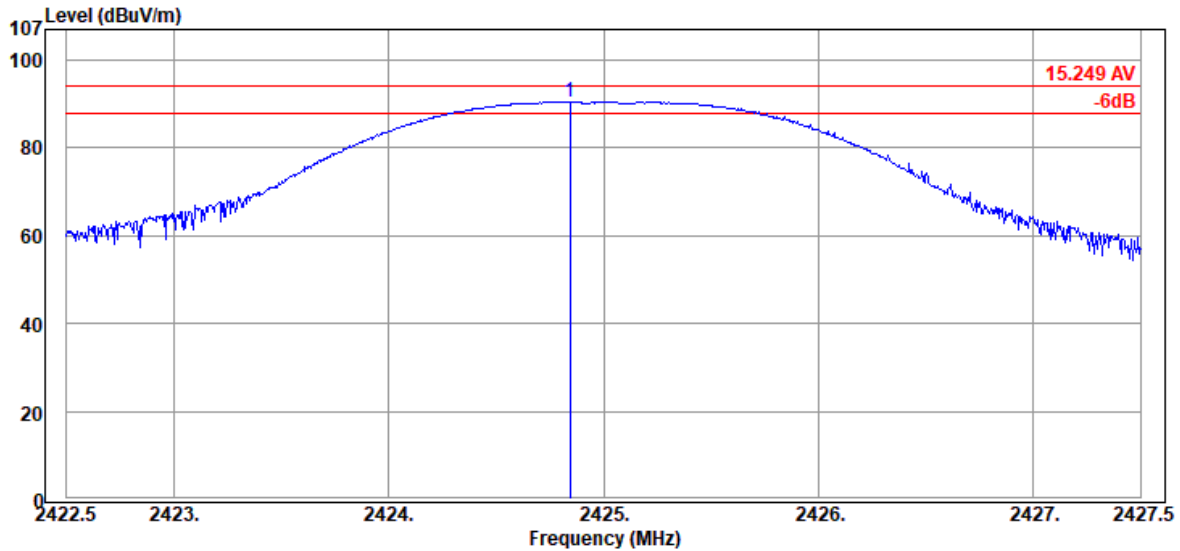
Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2420.01	28.29	6.10	34.54	89.97	89.82	114.0	24.18	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2420.01	89.82	-3.65	86.17	94.0	7.83	Average

Remark: Horizontal is the strongest polarization and peak value has complied with average limit, so vertical won't be listed in test report.

Mode	2.4G	Frequency	TX 2425MHz
------	------	-----------	------------



Antenna at Horizontal Polarization

Emission Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Gain (dB)	Read Level (dBμV)	Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Detector
2424.85	28.29	6.10	34.54	90.49	90.34	114.0	23.66	Peak

Emission Frequency (MHz)	Peak Emission Level (dBμV/m)	DCCF (dB)	Average Emission Level (dBμV/m)	Limits (dBμV/m)	Margin (dB)	Remark
2424.85	90.34	-3.65	86.69	94.00	7.31	Average

Remark: Horizontal is the strongest polarization and peak value has complied with average limit, so vertical won't be listed in test report.

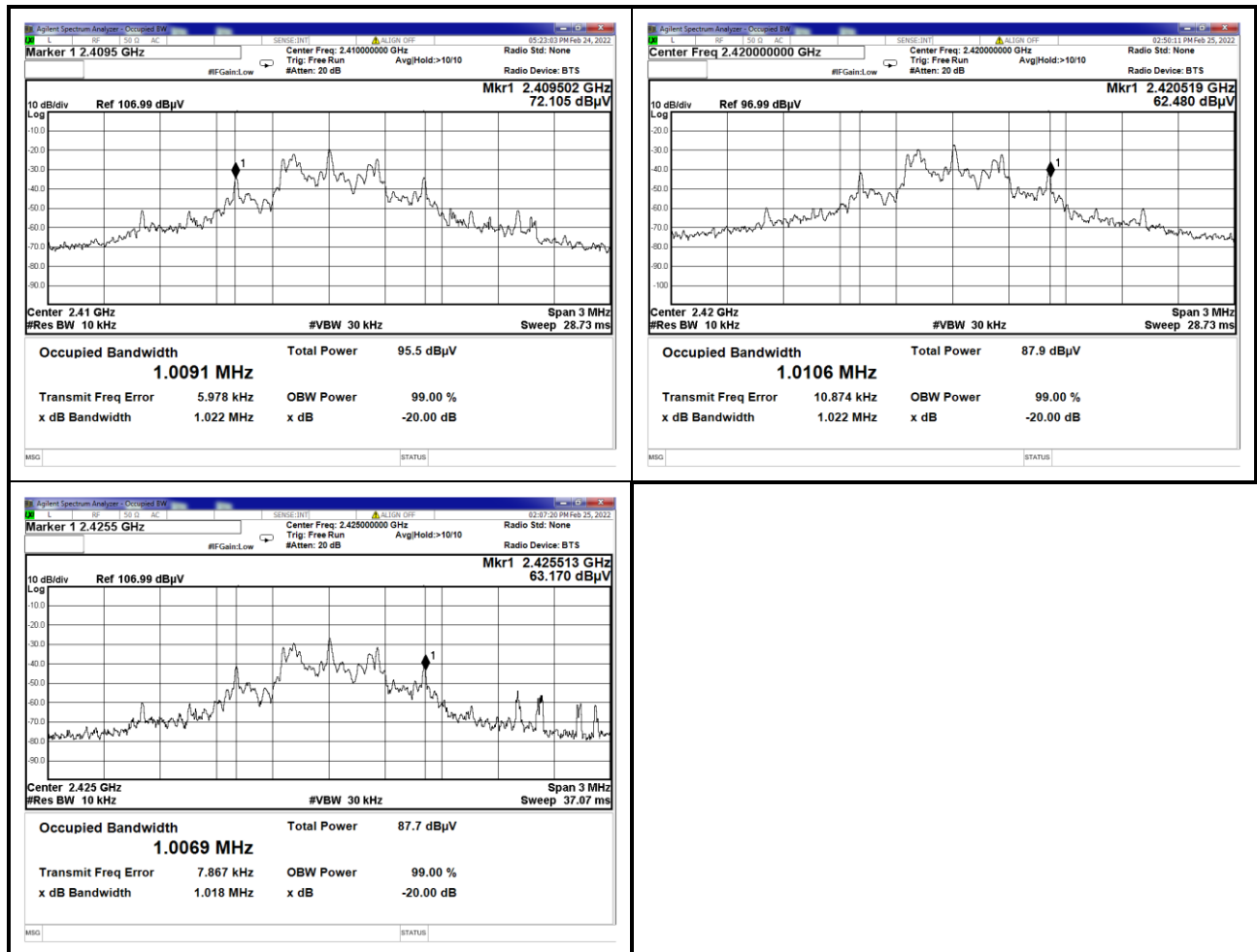
A.3 EMISSION BANDWIDTH MEASUREMENT

Test Date	2022/02/24 ~ 25	Temp./Hum.	15 ~ 16°C/71 ~ 72%
Test Voltage	AC 120V/60Hz		

A.3.1 Emission Bandwidth

Mode	Centre Frequency (MHz)	20dB Occupied Bandwidth (MHz)	99% Occupied Bandwidth (MHz)
2.4G	2410	1.022	1.0091
	2420	1.022	1.0106
	2425	1.018	1.0069

A.3.2 Measurement Plots





APPDNDIX B

TEST PHOTOGRAPHS

(Model: TR228A-A8106)