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FCC 15.247 & RSS-247
(Permissive Change)
2.4 GHz Test Report

for

FUTABA Corporation

1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN

Product Name	**:**	**Radio Control**
Model Name	**:**	**R7114SB**
Brand		**Futaba**
FCC ID	**:**	**AZP-R7014SB-24G**
IC	**:**	**2914D-R7014SB**

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

Testing Laboratory
1724

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.

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TEST REPORT
(Permissive Change)

Applicant	:	FUTABA Corporation
Manufacturer	:	FUTABA Corporation
EUT Description		
(1) Product	:	Radio Control
(2) Model	:	R7114SB
(3) Brand	:	Futaba
(4) Power Supply	:	DC 3.5 ~ 8.4V

Applicable Standards:

Title 47CFRFCC Part 15 Subpart C
RSS-Gen (Issue 5), April 2018
RSS-247 (Issue 2), February 2017
ANSI C63.10:2013

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: 2020. 09. 01

Reviewed by: Annie Yu (Annie Yu/Administrator)

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

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1. REVISION RECORD OF TEST REPORT

Edition No	Issued Date	Revision Summary	Report Number
0	2020. 09. 01	Original Report	EM-F200382

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2. SUMMARY OF TEST RESULTS

Rule		Description	Results
FCC	IC		
15.207	RSS-Gen §8.8	Conducted Emission	**N/A, NOTE 1**
15.247(d)/15.205	RSS-Gen §8.9 RSS-247 §5.5	Radiated Band Edge and Radiated Spurious Emission	**PASS**
15.247(a)(1)	RSS-247 §5.1(2)	20dB/Occupied Bandwidth	**N/A, NOTE 2**
15.247(a)(1)	RSS-247 §5.1(2)	Carrier Frequency Separation	**N/A, NOTE 2**
15.247(a)(1)(iii)	RSS-247 §5.1(4)	Time of Occupancy	**N/A, NOTE 2**
15.247(a)(1)(iii)	RSS-247 §5.1(4)	Number of Hopping Channels	**N/A, NOTE 2**
15.247(b)(1)	RSS-247 §5.1(2)	Maximum Peak Output Power	**PASS**
15.247(d)	RSS-247 §5.5	Conducted Band Edges and Conducted Spurious Emission	**N/A, NOTE 2**
15.203	RSS-Gen §6.8	Antenna Requirement	**Compliance**
Note: 1. The EUT only employs battery power for operation, so it is unnecessary to test. 2. To add new model R7114SB with new antenna is not influence on this item. 3. The uncertainties value is not used in determining the result.			

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3. GENERAL INFORMATION

3.1. Description of Application

Applicant	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN
Manufacturer	FUTABA Corporation 1080 Yabutsuka Chosei-mura Chosei-gun Chiba-ken 299-4395 JAPAN
Product	Radio Control
Model	R7114SB
Brand	Futaba

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3.2. Description of EUT

Test Model	R7114SB
Serial Number	N/A
Power Rating	DC 3.5 ~ 8.4V
Software Version	N/A
RF Features	FASSTest
Transmit Type	1T1R
Sample Status	Mass production
Test Sample	Sample No. -01 / Test Item: RSE, Output Power / Firmware: N/A
Date of Receipt	2020. 08. 10
Date of Test	2020. 08. 25
Interface Ports of EUT	N/A
Accessories Supplied	N/A

3.3. Information for Permissive Change

- The EUT is an addition version with original FCC ID: AZP-R7014SB-24G and IC: 2914D-R7014SB is as following.
  (a) To add new model R7114SB with new antenna.
- The differences between this application and original's ID as clarify in following list.

Item	Original		Permissive Change	
Model	R7014SB		R7114SB	
Output Power	0.0161W		0.012W	
Antenna Part Number	UFL-LP6-068N1T-A11-T-153D		ANTB24-104A0	
Manufacture	HRS		SANSEI ELECTRIC CO., LTD	
Antenna	2.4GHz Ant A	2.4GHz Ant B	2.4GHz Ant A	2.4GHz Ant B
Antenna Type	1/4λ Antenna	1/4λ Antenna	1/4λ Antenna	1/4λ Antenna
Antenna Gain	-5.35dBi	-5.35dBi	2.10dBi	2.10dBi

- Due to above different item, there have some test item should be re-tested (see section 2), the test data are recorded in this report.

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3.4. Antenna Information

No.	Part Number	Manufacture	Antenna Type	Frequency (MHz)	Max Gain(dBi)
1	UFL-LP6-068N1T-A 11-T-153D	HRS	1/4λ type	2.4GHz	ANT A: -5.35 ANT B: -5.35
2	ANTB24-104A0	SANSEI ELECTRIC CO., LTD	1/4λ type	2.4GHz	ANT A: 2.10 ANT B: 2.10

3.5. EUT Specifications Assessed in Current Report

Mode	Fundamental Range (MHz)	Channel Number	Modulation	Data Rate (Mbps)
FASSTest	2405.376 - 2472.960	23	DSSS (FSK)	136

Mode: FASSTest			
Channel List			
Channel Number	Frequency (MHz)	Channel Number	Frequency (MHz)
00	2405.376	12	2442.240
01	2408.448	13	2445.312
02	2411.520	14	2448.384
03	2414.592	15	2451.456
04	2417.664	16	2454.528
05	2420.736	17	2457.600
06	2423.808	18	2460.672
07	2462.880	19	2463.744
08	2429.952	20	2466.816
09	2433.024	21	2469.888
10	2436.096	22	2472.960
11	2439.168		

3.6. Description of Key Components

None

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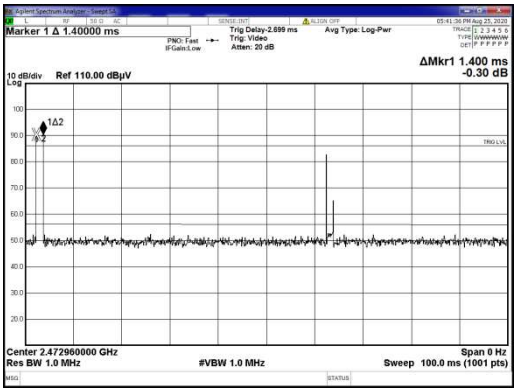
3.7. Test Configuration

Mode	TX_{on} (ms)	TX_{on+off} (ms)	$1/TX_{on}$ (kHz)	Duty Cycle Correction Factor (dB)
FASSTest	1.400	100	0.714	-37.08

Note: Duty Cycle Correction Factor (DCCF)= $20\log(TX_{on}/TX_{on+off})$。
"TX_{on+off}" means the period of the pulse train or 100ms if the pulse train length is greater than 100ms

Mode	TX_{on}
FASSTest	

Item		Mode	Test Channel
Radiated Test Case	Radiated Band Edge Note1	FASSTest	0/22
	Radiated Spurious Emission Note1	FASSTest	0/11/22
Conducted Test Case	Peak Output Power Note2	FASSTest	0/11/22

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

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3.8. Tested Supporting System List

3.8.1. Support Peripheral Unit

No.	Product	Brand	Model No.	Serial No.	Approval
1.	Notebook PC	acer	MS2343	N/A	Contains FCC ID: PPD-AR5BBU22 Contains IC: 4104A-AR5BBU22
2.	Test Jig	N/A	N/A	N/A	N/A
3.	DC Power Supply	TOP WORD	3303A	N/A	N/A
4.	Servo #1~ #5	Futaba	S3151	N/A	N/A
5.	Servo #6	Futaba	S-U300	N/A	N/A
6.	Servo #7 ~ #9	Futaba	S3050	N/A	N/A
7.	Servo #10 ~ #11	Futaba	S3003	N/A	N/A

3.8.2. Cable Lists

No.	Cable Description Of The Above Support Units
1.	Adapter: DELTA, M/N ADP-90CD DB, DC Cord: Shielded, Undetachable, 1.8m, Bonded a ferrite core AC Power Cord: Unshielded, Detachable, 1.8m
2.	Signal Cable: Unshielded, Detachable, 0.8m
3.	Power Wire: Unshielded, Detachable, 1.8m*2
4.	Signal Cable: Unshielded, Detachable, 0.2m*11

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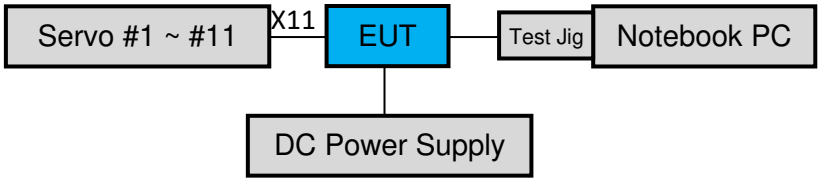
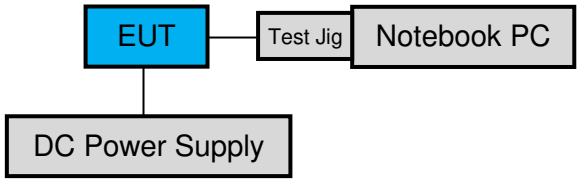
3.9. Setup Configuration

3.9.1. EUT Configuration for Radiated Emission



3.9.2. EUT Configuration for RF Conducted Test Items



3.10. Operating Condition of EUT

Test program "Futaba Term" is used for enabling EUT RF function under continue transmitting and choosing channel.

3.11. Description of Test Facility

Name of Test Firm	Audix Technology Corporation / EMC Department No. 53-11, Dingfu, 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.1 3m Semi Anechoic Chamber

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3.12.Measurement Uncertainty

Test Items/Facilities			Frequency Range	Uncertainty
Conduction Test			9kHz-150kHz	±3.7dB
			150kHz-30MHz	±3.5dB
Radiation Test	☒	No.1 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.1dB
			200MHz-1000MHz, 3m, Horizontal	±3.9dB
			30MHz-200MHz, 3m, Vertical	±4.2dB
			200MHz-1000MHz, 3m, Vertical	±4.1dB
			1GHz-6GHz, 3m	±4.2dB
			6GHz-18GHz, 3m	±4.6dB
	☐	No.3 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±3.9dB
			200MHz-1000MHz, 3m, Horizontal	±3.9dB
			30MHz-200MHz, 3m, Vertical	±4.4dB
			200MHz-1000MHz, 3m, Vertical	±4.1dB
	☐	No.4 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.3dB
			200MHz-1000MHz, 3m, Horizontal	±4.0dB
			30MHz-200MHz, 3m, Vertical	±4.3dB
			200MHz-1000MHz, 3m, Vertical	±4.4dB
			1GHz-6GHz, 3m	±4.5dB
			6GHz-18GHz, 3m	±4.6dB
	☐	No.5 3m Semi Anechoic Chamber	30MHz-200MHz, 3m, Horizontal	±4.0dB
			200MHz-1000MHz, 3m, Horizontal	±3.9dB
			30MHz-200MHz, 3m, Vertical	±4.2dB
			200MHz-1000MHz, 3m, Vertical	±4.3dB
			1GHz-6GHz, 3m	±4.3dB
			6GHz-18GHz, 3m	±4.7dB
	☐	Fully Anechoic Chamber	30MHz~1000MHz	±4.7dB
			1GHz~18GHz	±5.3dB

Remark：Uncertainty = $ku_c(y)$

Test Item	Uncertainty
20dB Bandwidth	±0.2kHz
99% Occupied Bandwidth	±0.38%
Carrier Frequency Separation	±0.2kHz
Time of Occupancy	±0.03sec
Maximum peak Output power	± 0.52dB
Conducted Emission Limitations	± 0.13dB

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4. MEASUREMENT EQUIPMENTLIST

4.1. Radiated Emission Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Agilent	N9030A-526	MY53310269	2020.01.16	1 Year
2.	Test Receiver	R & S	ESCS30	100338	2020.06.10	1 Year
3.	Amplifier	HP	8447D	2944A06305	2020.01.16	1 Year
4.	Microwave Preamplifier	Keysight	83051A	MY53010042	2020.08.05	1 Year
5.	Microwave Preamplifier	HP	8449B	3008A01284	2020.05.26	1 Year
6.	Loop Antenna	R&S	HFH2-Z2	891847/27	2019.12.26	2 Years
7.	Bilog Antenna	CHASE	CBL6112D	33821	2020.01.17	1 Year
8.	Horn Antenna	EMCO	3115	9609-4927	2020.06.23	1 Year
9.	Horn Antenna	COM-POWER	AH-840	101092	2020.05.08	1 Year
10.	Notch Filter	K&L	7NSL10-2441.5/E130.5-O/O	1	2020.07.24	1 Year
11.	High-Pass Filter	Microwave	H3G018G1	484796	2020.08.20	1 Year
12.	Digital Thermo-Hygro Meter	iMax	HTC-1	No.1 3m A/C	2020.04.17	1 Year
13.	Signal Cable	MIYAZAKI	5D2W	RE-11	2020.01.31	1 Year
14.	Coaxial Cable	HUBER+SUHNER	SUCOFLEX 102	No.1 18-40GHz Cable	2019.09.20	1 Year
15.	Test Software	Audix	e3	V6.120619c	N.C.R.	N.C.R.

4.2. RF Conducted Measurement

Item	Type	Manufacturer	Model No.	Serial No.	Cal. Date	Cal. Interval
1.	Spectrum Analyzer	Keysight	N9020B-544	MY57120357	2020. 01. 10	1 Year
2.	Digital Thermo-Hygro Meter	Shenzhen Datronn Electronics	KT-905	RF	2020. 04. 17	1 Year

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5. CONDUCTED EMISSION

【The EUT only employs battery power for operation, no conductive emission limits are required according to FCC Part 15 Section §15.207 and RSS-Gen §8.8】

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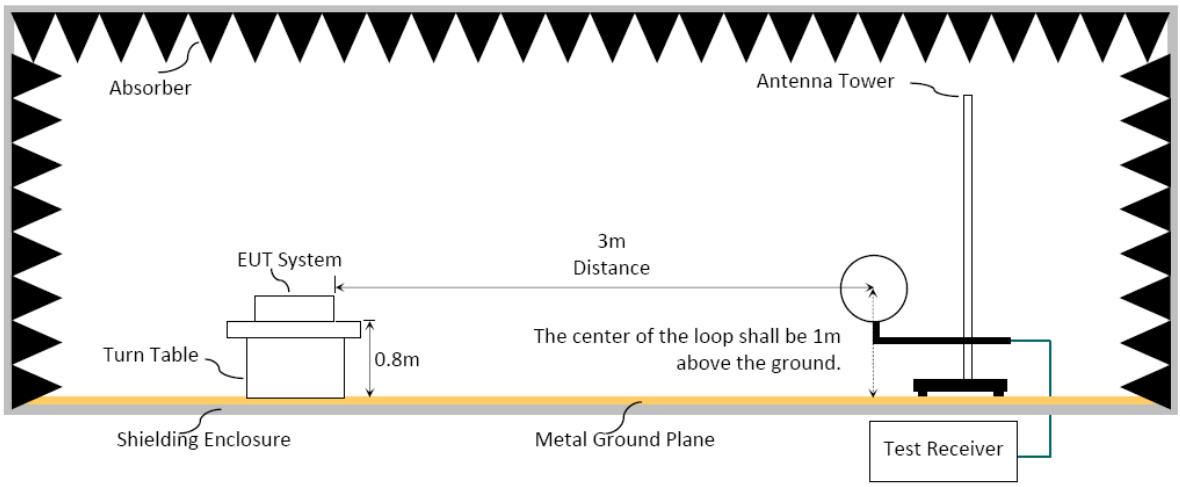
6. RADIATED EMISSION

6.1. Block Diagram of Test Setup

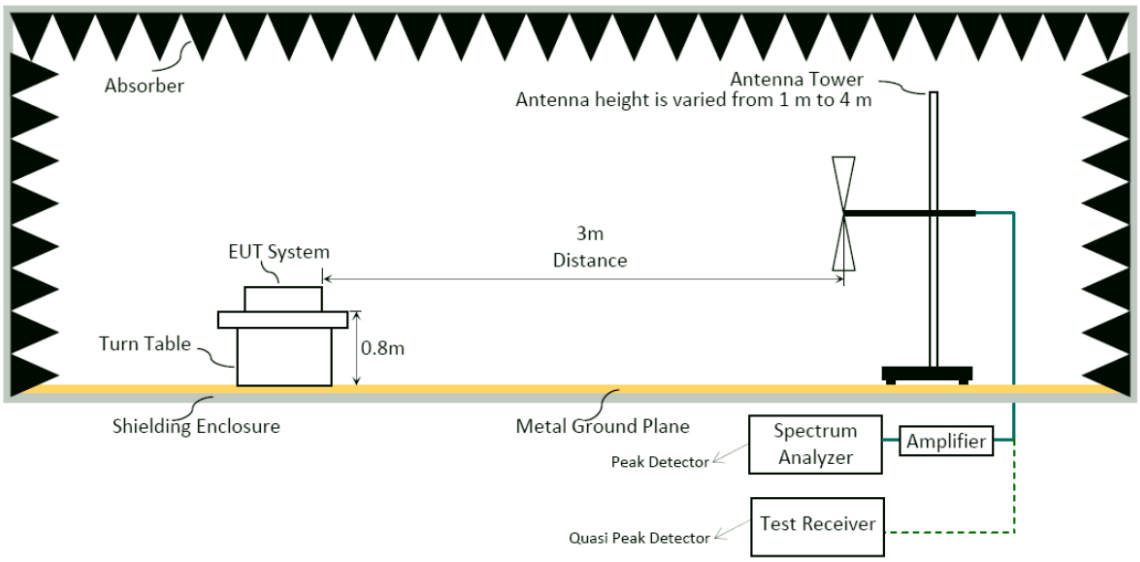
6.1.1. Block Diagram of EUT

Indicated as section 3.9

6.1.2. Setup Diagram for 9kHz-30MHz



6.1.3. Setup Diagram for 30-1000MHz



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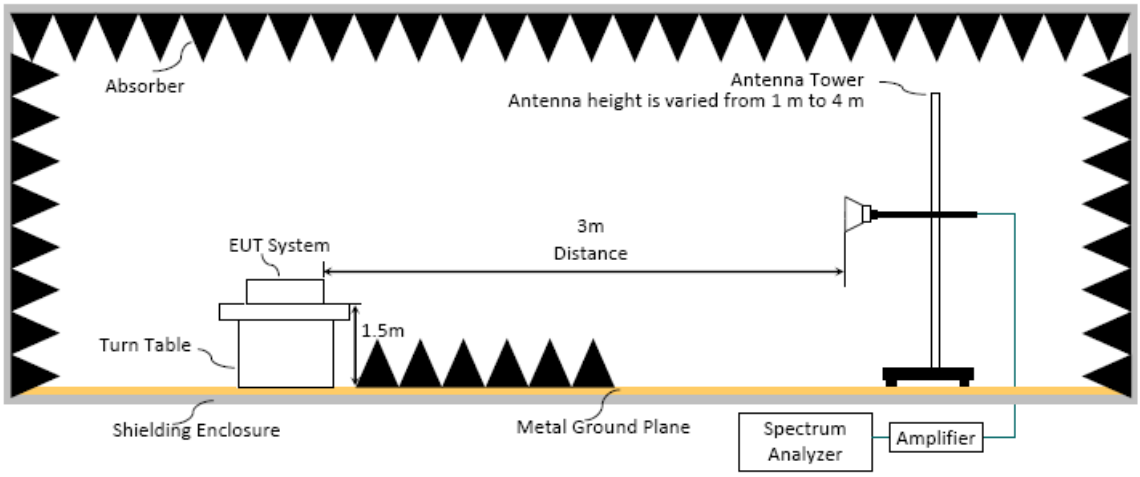
6.1.4. Setup Diagram for above 1GHz



6.2. Radiated Emission Limits

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 Section 15.205/RSS-Gen Section 8.10 table 6, must also comply with the radiated emission limits specified as below.

Frequency (MHz)	Distance(m)	Limits	
		dBµV/m	µV/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 dBµV/m (Peak) 54.0 dBµV/m (Average)	

Remark：(1) dBµV/m = 20 log (µV/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.

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6.3. Test Procedure

Frequency Range 9kHz~30MHz:
The EUT setup on the turntable which has 0.8 m 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 C63.10-2013regulation.

(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 turn table which has 80cm (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 (for 30-1000MHz) and from 1m to 3m (for above 1GHz at fully Anechoic Chamber)or from 1 m to 4 m (for above 1GHz at Semi Anechoic Chamber) 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 C63.10-2013regulation.

Frequency below 1GHz:
Spectrum Analyzer is used for pre-testing with following setting:

(1)RBW = 120KHz

(2)VBW ≥ 3 x 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 theQ.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

(2)VBW ≥ 3 x 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.

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Average Detector:

☐**Option 1:**

(1)RBW = 1MHz
(2)VBW ≥ 1/ T.
(3)Detector = Peak.
(4)Sweep time = auto.
(5)Trace mode = max hold.
(6)Allow sweeps to continue until the trace stabilizes.

■**Option 2:**

Average Emission Level= Peak Emission Level+ D.C.C.F.

6.4. Measurement Result Explanation

■Peak Emission Level=Antenna Factor + Cable Loss + Meter Reading (including Preamp factor if test used)

☐Average Emission Level l=Antenna Factor + Cable Loss +Meter Reading (including Preamp factor if test used)

■Average Emission Level= Peak Emission Level+ DCCF

Duty Cycle Correction Factor (DCCF)= 20log(TX_{on}/TX_{on+off}) presented in section 3.6

☐ERP= Peak Emission Level-95.2dB-2.14dB

6.5. Test Results

Please refer to Appendix A.

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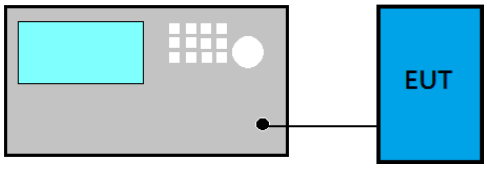
7. MAXIMUM PEAK OUTPUT POWER

7.1. Block Diagram of Test Setup



7.2. Specification Limits

The Limits of maximum Peak Output Power for frequency hopping systems in 2400-2483.5MHz is: 0.125Watt. (21dBm)

7.3. Test Procedure

Following measurement procedure is reference to ANSI C63.10:2013:

(a) Use the following spectrum analyzer settings

(1) Span: Approximately five times the 20 dB bandwidth, centered on a hopping channel.
(2) RBW > 20 dB bandwidth of the emission being measured.
(3) VBW ≥ RBW
(4) Sweep:Auto
(5) Detector function: Peak
(6) Trace:Max hold

(b) Allow trace to stabilize.

(c) Use the marker-to-peak function to set the marker to the peak of the emission.

7.4. Test Results

Please refer to Appendix A

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8. DEVIATION TO TEST SPECIFICATIONS

【NONE】

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APPDNDIX A

TEST DATA AND PLOTS

(Model: R7114SB)

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A.1 RADIATED EMISSION

Test Date	2020/08/25	Temp./Hum.	25℃/46%
Test Voltage	DC 6.0V (Via DC Power Supply)	Tested By	Sam Chang

A.1.1 Emissions within Restricted Frequency Bands

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	FASSTest	Frequency	TX 2405.376MHz

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
167.740	15.86	3.23	25.98	44.45	37.56	43.50	5.94	Peak
207.510	15.91	3.62	25.85	46.10	39.78	43.50	3.72	Peak
216.240	16.49	3.70	25.83	43.72	38.08	46.00	7.92	Peak
827.340	26.31	8.29	27.34	34.00	41.26	46.00	4.74	Peak
960.230	27.17	8.98	26.95	32.05	41.25	54.00	12.75	Peak
999.030	27.40	9.16	26.84	31.69	41.41	54.00	12.59	Peak

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
38.730	19.77	1.45	26.52	39.87	34.57	40.00	5.43	Peak
76.560	12.92	2.12	26.39	46.93	35.58	40.00	4.42	Peak
107.600	17.53	2.53	26.27	39.36	33.15	43.50	10.35	Peak
483.960	23.25	6.78	27.13	33.36	36.26	46.00	9.74	Peak
832.190	26.35	8.32	27.32	34.85	42.20	46.00	3.80	Peak
944.710	27.09	8.92	27.01	30.89	39.89	46.00	6.11	Peak

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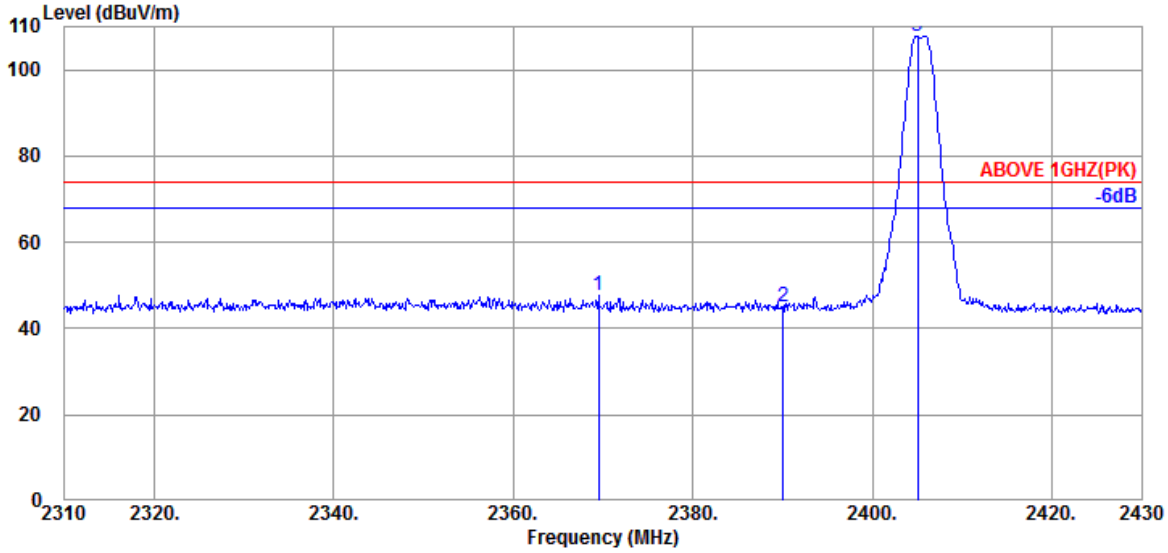
A.2.1.3 Frequency Above 1 GHz to 10th harmonics

Band Edge:

Mode	FASSTest	Frequency	TX 2405.376MHz



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
	2369.520	28.23	3.49	39.91	55.80	47.61	74.00	26.39	Peak
	2390.040	28.27	3.50	39.91	53.12	44.98	74.00	29.02	Peak
@	2405.040	28.34	3.51	39.91	115.94	107.88	---	---	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
2369.52	47.61	-37.08	10.53	54.00	43.47	Average
2390.04	44.98	-37.08	7.90	54.00	46.10	Average

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

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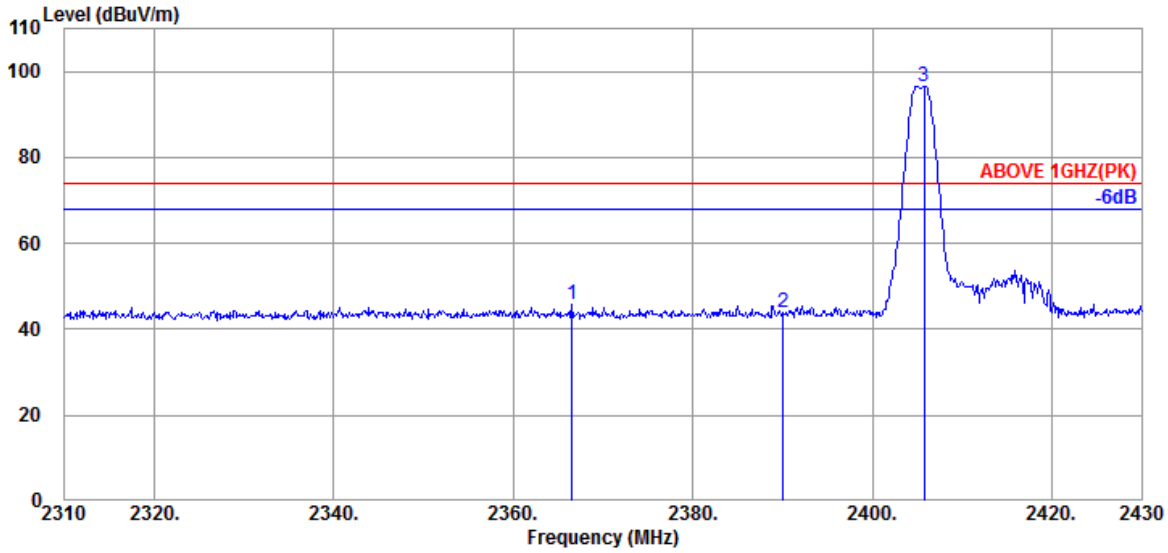
Mode	FASSTest	Frequency	TX 2405.376MHz



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
	2366.520	28.23	3.49	39.91	53.83	45.64	74.00	28.36	Peak
	2390.040	28.27	3.50	39.91	52.05	43.91	74.00	30.09	Peak
@	2405.760	28.34	3.51	39.91	104.70	96.64	---	---	Peak

Frequency (MHz)	Peak Value (dBµV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
2366.52	45.64	-37.08	8.56	54.00	45.44	Average
2390.04	43.91	-37.08	6.83	54.00	47.17	Average

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

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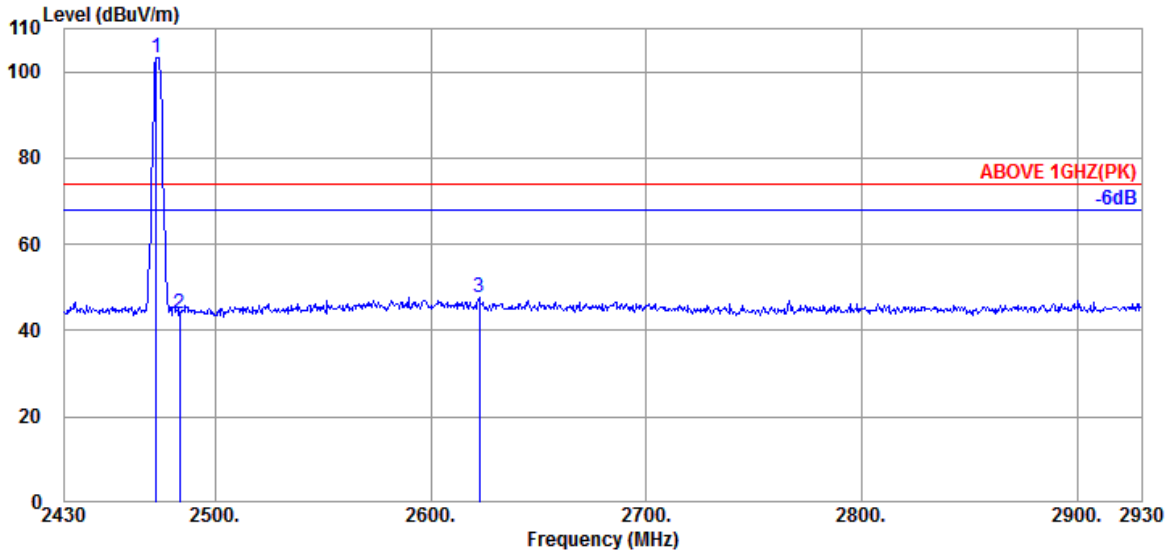
Mode	FASSTest	Frequency	TX 2472.960MHz



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
@	2472.500	28.60	3.55	39.91	111.07	103.31	---	---	Peak
	2483.500	28.60	3.56	39.91	51.81	44.06	74.00	29.94	Peak
	2622.500	29.00	3.64	39.94	55.11	47.81	74.00	26.19	Peak

Frequency (MHz)	Peak Value (dBµV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
2483.5	44.06	-37.08	6.98	54.00	47.02	Average
2622.5	47.81	-37.08	10.73	54.00	43.27	Average

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

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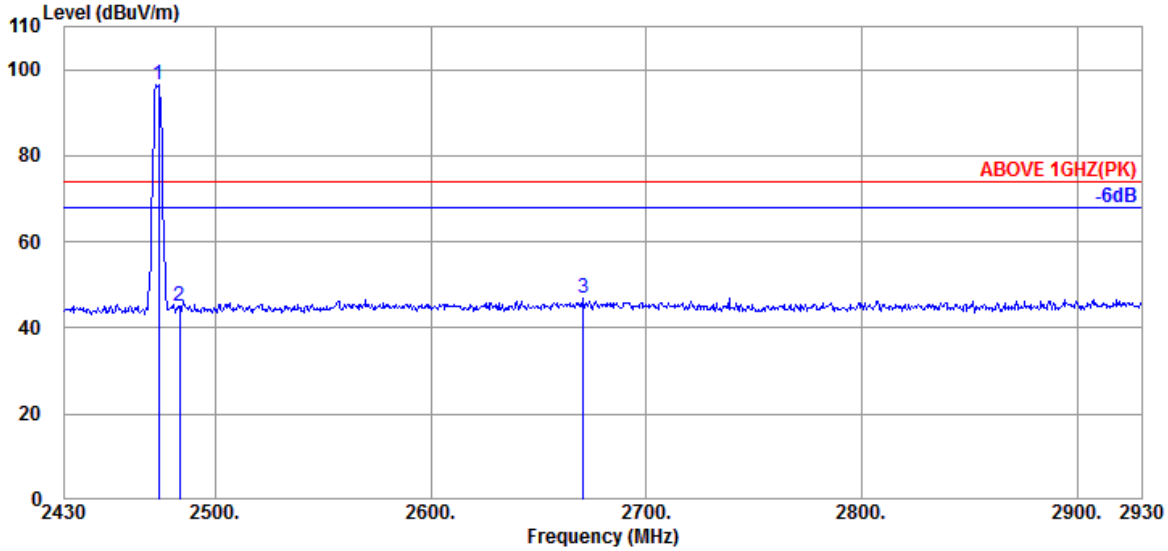
Mode	FASSTest	Frequency	TX 2472.960MHz



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
@	2473.500	28.60	3.56	39.91	104.17	96.42	---	---	Peak
	2483.500	28.60	3.56	39.91	52.74	44.99	74.00	29.01	Peak
	2671.000	28.99	3.67	39.95	54.34	47.05	74.00	26.95	Peak

Frequency (MHz)	Peak Value (dBµV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Remark
2483.5	44.99	-37.08	7.91	54.00	46.09	Average
2671.0	47.05	-37.08	9.97	54.00	44.03	Average

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

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A.1.2 Emissions outside the frequency band:

The emissions (up to 25GHz) not reported for there is no emission be found.

Mode	FASSTest	Frequency	TX 2405.376MHz

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
3206.000	31.18	6.71	39.87	56.89	54.91	74.00	19.09	Peak
4810.000	33.40	8.17	39.33	50.71	52.95	74.00	21.05	Peak
7214.000	36.50	10.02	39.44	46.29	53.37	74.00	20.63	Peak
9620.000	38.00	11.68	39.86	50.42	60.24	74.00	13.76	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
3206.00	54.91	-37.08	17.83	54.00	36.17	Average
4810.00	52.95	-37.08	15.87	54.00	38.13	Average
7214.00	53.37	-37.08	16.29	54.00	37.71	Average
9620.00	60.24	-37.08	23.16	54.00	30.84	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
3208.000	31.18	6.71	39.86	55.90	53.93	74.00	20.07	Peak
4810.000	33.40	8.17	39.33	61.73	63.97	74.00	10.03	Peak
7214.000	36.50	10.02	39.44	53.53	60.61	74.00	13.39	Peak
9620.000	38.00	11.68	39.86	55.65	65.47	74.00	8.53	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
3208.00	53.93	-37.08	16.85	54.00	37.15	Average
4810.00	63.97	-37.08	26.89	54.00	27.11	Average
7214.00	60.61	-37.08	23.53	54.00	30.47	Average
9620.00	65.47	-37.08	28.39	54.00	25.61	Average

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Mode	FASSTest	Frequency	TX 2439.168MHz

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
3252.000	31.10	6.75	39.83	54.54	52.56	74.00	21.44	Peak
4878.000	33.45	8.20	39.29	50.06	52.42	74.00	21.58	Peak
7316.000	36.70	10.09	39.47	46.99	54.31	74.00	19.69	Peak
9760.000	38.00	11.79	39.81	51.32	61.30	74.00	12.70	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
3252.00	52.56	-37.08	15.48	54.00	38.52	Average
4878.00	52.42	-37.08	15.34	54.00	38.66	Average
7316.00	54.31	-37.08	17.23	54.00	36.77	Average
9760.00	61.3	-37.08	24.22	54.00	29.78	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
3254.000	31.10	6.76	39.83	52.11	50.14	74.00	23.86	Peak
4878.000	33.45	8.20	39.29	61.41	63.77	74.00	10.23	Peak
7316.000	36.70	10.09	39.47	53.10	60.42	74.00	13.58	Peak
9760.000	38.00	11.79	39.81	54.94	64.92	74.00	9.08	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
3254.00	50.14	-37.08	13.06	54.00	40.94	Average
4878.00	63.77	-37.08	26.69	54.00	27.31	Average
7316.00	60.42	-37.08	23.34	54.00	30.66	Average
9760.00	64.92	-37.08	27.84	54.00	26.16	Average

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Mode	FASSTest	Frequency	TX 2472.960MHz

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
3298.000	31.20	6.80	39.80	52.59	50.79	74.00	23.21	Peak
4946.000	33.70	8.23	39.26	49.59	52.26	74.00	21.74	Peak
7421.000	36.73	10.17	39.50	48.28	55.68	74.00	18.32	Peak
9890.000	38.20	11.91	39.76	48.54	58.89	74.00	15.11	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
3298.00	50.79	-37.08	13.71	54.00	40.29	Average
4946.00	52.26	-37.08	15.18	54.00	38.82	Average
7421.00	55.68	-37.08	18.60	54.00	35.40	Average
9890.00	58.89	-37.08	21.81	54.00	32.19	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
3296.000	31.20	6.80	39.80	50.32	48.52	74.00	25.48	Peak
4946.000	33.70	8.23	39.26	62.97	65.64	74.00	8.36	Peak
7418.000	36.73	10.17	39.49	51.38	58.79	74.00	15.21	Peak
9890.000	38.20	11.91	39.76	52.34	62.69	74.00	11.31	Peak

Frequency (MHz)	Peak Value (dBμV/m)	Duty Cycle Correction Factor (dB)	Average Value (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Remark
3296.00	48.52	-37.08	11.44	54.00	42.56	Average
4946.00	65.64	-37.08	28.56	54.00	25.44	Average
7418.00	58.79	-37.08	21.71	54.00	32.29	Average
9890.00	62.69	-37.08	25.61	54.00	28.39	Average

A.1.3 Emissions in Non-restricted Frequency Bands:

All emission levels below the FCC 15.209(a)/RSS-Gen Section 8.9 table 4 general radiated emissions limits is not required.

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A.2 MAXIMUM PEAK OUTPUT POWER

Test Date	2020/08/25	Temp./Hum.	25℃/52%
Cable Loss	0.95dB	Tested By	Sam Chang
Test Voltage	DC 6.0V (Via DC Power Supply)		

A.2.1 Maximum Peak Output Power

Antenna	Centre Frequency (MHz)	Maximum Peak Output Power		Limit
		dBm	W	
ANT A	2405.376	10.74	0.012	21dBm (0.125W)
	2439.168	10.61	0.012	
	2472.960	10.53	0.011	
ANT B	2405.376	10.70	0.012	
	2439.168	10.51	0.011	
	2472.960	10.41	0.011	

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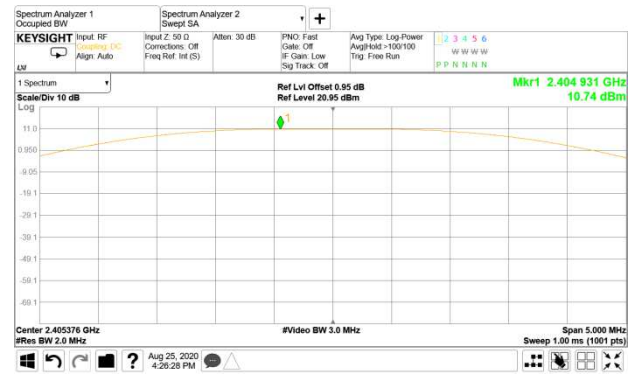
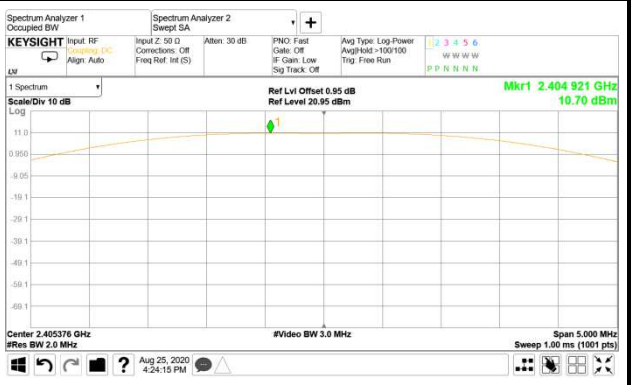
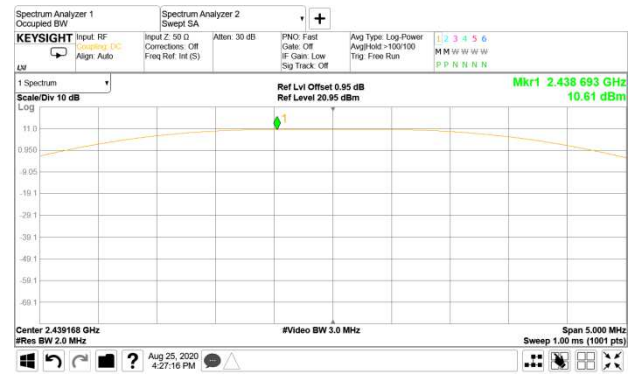
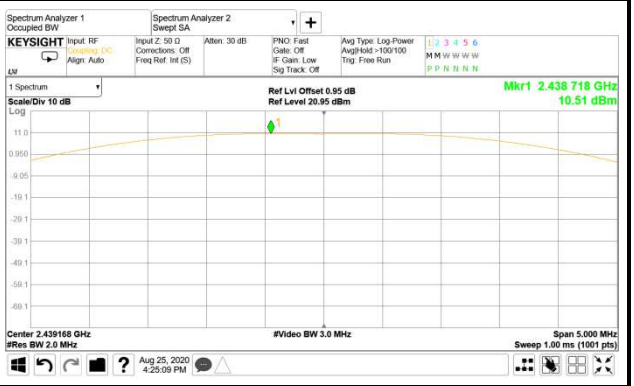
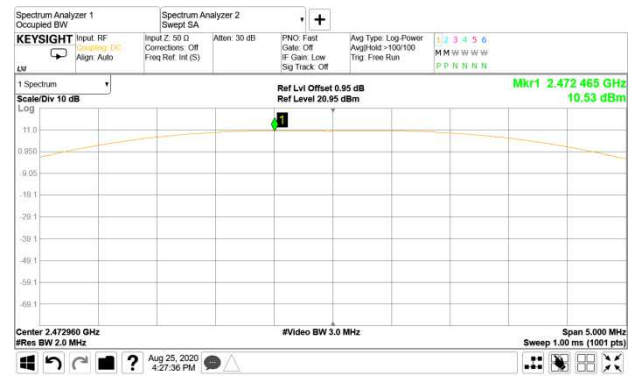
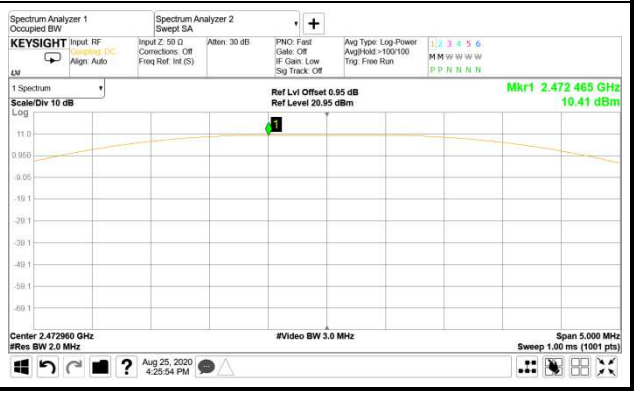
A.2.2 Measurement Plots

ANT A	ANT B
	
	
	

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APPDNDIX B

TEST PHOTOGRAPHS

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