

TEST REPORT

Product : 915MHz 4-Buttons Transmitter
Trade mark : MANARAS-OPERA
Model/Type reference : RADIOEM204
Serial Number : N/A
Report Number : EED32P81638201
FCC ID : X7ORADIOEM204
Date of Issue : Dec. 25, 2023
Test Standards : 47 CFR Part 15 Subpart C
Test result : PASS

Prepared for:

9141-0720 Quebec Inc. DBA MANARAS/OPERA
136 Oneida Drive, Pointe-Claire, Canada, H9R 1A8

Prepared by:

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Date:

Dec. 25, 2023



Check No.:1036161023

1 Version

Version No.	Date	Description
00	Dec. 25, 2023	Original

2 Test Summary

Test Item	Test Requirement	Test method	Result
Antenna Requirement	47 CFR Part 15 Subpart C Section 15.203	ANSI C63.10-2013	PASS
AC Power Line Conducted Emission	47 CFR Part 15 Subpart C Section 15.207	ANSI C63.10-2013	N/A
Field Strength of the Fundamental Signal	47 CFR Part 15 Subpart C Section 15.249 (a)	ANSI C63.10-2013	PASS
Spurious Emissions	47 CFR Part 15 Subpart C Section 15.249 (a)/15.209	ANSI C63.10-2013	PASS
Restricted bands around fundamental frequency (Radiated Emission)	47 CFR Part 15 Subpart C Section 15.249(a)/15.205	ANSI C63.10-2013	PASS
20dB Occupied Bandwidth	47 CFR Part 15 Subpart C Section 15.215 (c)	ANSI C63.10-2013	PASS

Remark:

N/A:The product is powered by battery of DC 3.0V.

Company Name and Address shown on Report, the sample(s) and sample Information were provided by the applicant who should be responsible for the authenticity which CTI hasn't verified.

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4 General Information

4.1 Client Information

Applicant:	9141-0720 Quebec Inc. DBA MANARAS/OPERA
Address of Applicant:	136 Oneida Drive, Pointe-Claire, Canada, H9R 1A8
Manufacturer:	9141-0720 Quebec Inc. DBA MANARAS/OPERA
Address of Manufacturer:	136 Oneida Drive, Pointe-Claire, Canada, H9R 1A8

4.2 General Description of EUT

Product Name:	915MHz 4-Buttons Transmitter
Model No.:	RADIOEM204
Trade mark:	MANARAS-OPERA
Product Type:	☐ Mobile ☒ Portable ☐ Fix Location
Frequency Range:	915MHz
Number of Channels:	1 (declared by the client)
Modulation type:	OOK
Antenna Type:	PCB antenna
Antenna gain:	0dBi
Test Software of EUT:	RF test
Test Power Grade:	Default
Power Supply:	DC3.0V,20mA Battery
Test Voltage:	DC 3.0V
Sample Received Date:	Oct. 16, 2023
Sample tested Date:	Oct. 16, 2023 to Dec. 25, 2023

Operation Frequency each of channel :	
Channel	Frequency(MHz)
CH1	915

Note:

In section 15.31(m), regards to the operating frequency range over 10 MHz, the only frequency of channel were selected to perform the test, and the selected channel see below:

Channel	Frequency(MHz)
CH1	915

4.3 Test Environment and Mode

Operating Environment:	
Temperature:	22~25.0 °C
Humidity:	50~55 % RH
Atmospheric Pressure:	1010mbar
Test mode:	
Transmitting mode:	Keep the EUT in transmitting mode with modulation.

4.4 Description of Support Units

The EUT has been tested independently.

4.5 Test Location

All tests were performed at:

Centre Testing International Group Co., Ltd

Building C, Hongwei Industrial Park Block 70, Bao'an District, Shenzhen, China

Telephone: +86 (0) 755 33683668 Fax: +86 (0) 755 33683385

No tests were sub-contracted.

FCC Designation No.: CN1164

4.6 Deviation from Standards

None.

4.7 Abnormalities from Standard Conditions

None.

4.8 Other Information Requested by the Customer

None.

4.9 Measurement Uncertainty (95% confidence levels, k=2)

No.	Item	Measurement Uncertainty
1	Radio Frequency	7.9×10^{-8}
2	RF power, conducted	0.46dB (30MHz-1GHz)
		0.55dB (1GHz-18GHz)
3	Radiated Spurious emission test	3.3dB (9kHz-30MHz)
		4.3dB (30MHz-1GHz)
		4.5dB (1GHz-18GHz)
		3.4dB (18GHz-40GHz)
4	Conduction emission	3.5dB (9kHz to 150kHz)
		3.1dB (150kHz to 30MHz)
5	Temperature test	0.64°C
6	Humidity test	3.8%
7	DC power voltages	0.026%

5 Equipment List

3M Semi/full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
3M Chamber & Accessory Equipment	TDK	SAC-3	---	05-22-2022	05-21-2025
Receiver	R&S	ESC17	100938-003	09-28-2022 09-22-2023	09-27-2023 09-21-2024
Spectrum Analyzer	R&S	FSV40	101200	07-29-2022 07-25-2023	07-28-2023 07-24-2024
Loop Antenna	Schwarzbeck	FMZB 1519B	1519B-076	04-15-2021	04-14-2024
TRILOG Broadband Antenna	Schwarzbeck	VULB9163	9163-618	05-22-2022 05-21-2023	05-21-2023 05-20-2024
Horn Antenna	Schwarzbeck	BBHA 9120D	9120D-1869	04-17-2021	04-16-2024
Horn Antenna	A.H.SYSTEMS	SAS-574	374	05-29-2021	05-28-2024
Preamplifier	Agilent	11909A	12-1	03-28-2023	03-27-2024
Preamplifier	EMCI	EMC051845 SE	980380	12-23-2022 12-14-2023	12-22-2023 12-13-2024
Preamplifier	CD	PAP-1840-60	6041.6042	07-05-2022 07-03-2023	07-04-2023 07-02-2024
Cable line	Fulai(7M)	SF106	5219/6A	---	---
Cable line	Fulai(6M)	SF106	5220/6A	---	---
Cable line	Fulai(3M)	SF106	5216/6A	---	---
Cable line	Fulai(3M)	SF106	5217/6A	---	---
Test software	Fara	EZ-EMC	EMEC-3A1-Pre	---	---

3M full-anechoic Chamber					
Equipment	Manufacturer	Model No.	Serial Number	Cal. date (mm-dd-yyyy)	Cal. Due date (mm-dd-yyyy)
Fully Anechoic Chamber	TDK	FAC-3	---	01-09-2021	01-08-2024
Receiver	Keysight	N9038A	MY57290136	02-27-2023	02-26-2024
Spectrum Analyzer	Keysight	N9020B	MY57111112	02-21-2023	02-20-2024
Spectrum Analyzer	Keysight	N9030B	MY57140871	02-21-2023	02-20-2024
TRILOG Broadband Antenna	Schwarzbeck	VULB 9163	9163-1148	04-30-2021	04-29-2024
Horn Antenna	Schwarzbeck	BBHA 9170	9170-832	04-17-2021	04-16-2024
Horn Antenna	ETS-LINDGREN	3117	57407	07-04-2021	07-03-2024
Preamplifier	EMCI	EMC001330	980563	03-28-2023	03-27-2024
Preamplifier	Tonscend	TAP-011858	AP21B806112	07-25-2023	07-24-2024
Preamplifier	EMCI	EMC184055SE	980597	04-13-2023	04-12-2024
Temperature/Humidity Indicator	biaozhi	GM1360	EE1186631	04-11-2023	04-10-2024
RSE Automatic test software	JS Tonscend	JS36-RSE	V4.0.0.0	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0001		---
Cable line	Times	SFT205-NMSM-2.50M	394812-0002	---	---
Cable line	Times	SFT205-NMSM-2.50M	394812-0003	---	---
Cable line	Times	SFT205-NMSM-2.50M	393495-0001	---	---
Cable line	Times	EMC104-NMNM-1000	SN160710	---	---
Cable line	Times	SFT205-NMSM-3.00M	394813-0001	---	---
Cable line	Times	SFT205-NMNM-1.50M	381964-0001	---	---
Cable line	Times	SFT205-NMSM-7.00M	394815-0001	---	---
Cable line	Times	HF160-KMKM-3.00M	393493-0001	---	---

6 Test results and Measurement Data

6.1 Antenna Requirement

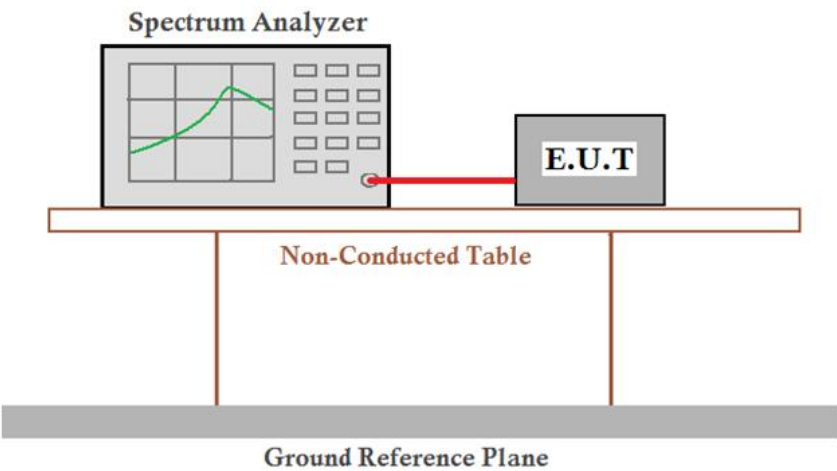
Standard requirement:	47 CFR Part 15C Section 15.203
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, 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.	
EUT Antenna:	Please see Internal photos
The antenna is integrated on the main PCB and no consideration of replacement.	

6.2 Radiated Spurious Emissions

6.2.1 Duty Cycle

Test Requirement: 47 CFR Part 15C Section 15.35 (c)
Test Method: ANSI C63.10:2013

Test Setup:



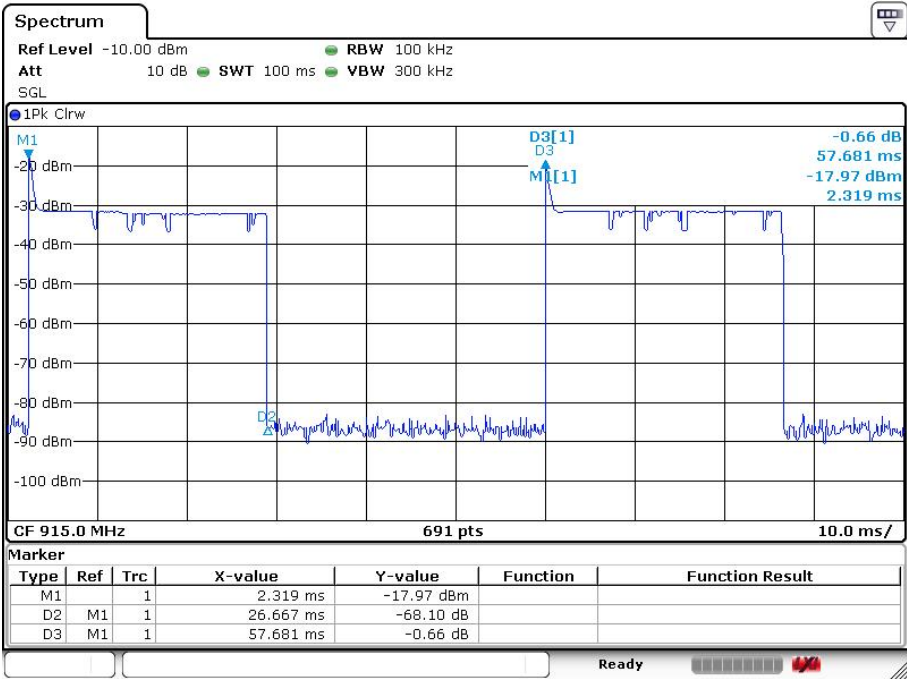
Limit: N/A
Test Mode: Transmitting mode
Test Results: Pass

The number of pulses of duration /100ms	T on time (ms)/one burst	T on time (ms)/100ms	T period (ms)	Duty cycle
2	26.667	53.334	100	53.334%

Note:

- ① $T \text{ on time}(\text{ms})/100\text{ms} = \text{The number of pulses of duration}/100\text{ms} * T \text{ on time}(\text{ms})/\text{one burst}$;
② $\text{Duty cycle} = T \text{ on time}(\text{ms})/100\text{ms} / T \text{ period}(\text{ms}) * 100\%$;

Test plot as follows:
The number of pulses of duration/100ms: number is 2



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6.2.2 Radiated Spurious Emissions

Test Requirement: 47 CFR Part 15C Section 15.249 and 15.209 and 15.205

Test Method: ANSI C63.10

Test Site: Measurement Distance: 3m (Semi-Anechoic Chamber)

Receiver Setup:

Frequency	Detector	RBW	VBW	Remark
0.009MHz-0.090MHz	Peak	10kHz	30kHz	Peak
0.009MHz-0.090MHz	Average	10kHz	30kHz	Average
0.090MHz-0.110MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
0.110MHz-0.490MHz	Peak	10kHz	30kHz	Peak
0.110MHz-0.490MHz	Average	10kHz	30kHz	Average
0.490MHz -30MHz	Quasi-peak	10kHz	30kHz	Quasi-peak
30MHz-1GHz	Quasi-peak	120kHz	300kHz	Quasi-peak
Above 1GHz	Peak	1MHz	3MHz	Peak
	Peak	1MHz	10kHz	Average

Limit:
(Spurious Emissions)

Frequency	Field strength (microvolt/meter)	Limit (dBμV/m)	Remark	Measurement distance (m)
0.009MHz-0.490MHz	2400/F(kHz)	-	-	300
0.490MHz-1.705MHz	24000/F(kHz)	-	-	30
1.705MHz-30MHz	30	-	-	30
30MHz-88MHz	100	40.0	Quasi-peak	3
88MHz-216MHz	150	43.5	Quasi-peak	3
216MHz-960MHz	200	46.0	Quasi-peak	3
960MHz-1GHz	500	54.0	Quasi-peak	3
Above 1GHz	500	54.0	Average	3

Note: 15.35(b), Unless otherwise specified, the limit on peak radio frequency emissions is 20dB above the maximum permitted average emission limit applicable to the equipment under test. This peak limit applies to the total peak emission level radiated by the device.

Limit:
(Field strength of the fundamental signal)

Frequency	Limit (dBμV/m @3m)	Remark
911MHz-919MHz	94.0	Average Value
	114.0	Peak Value

Test Setup:

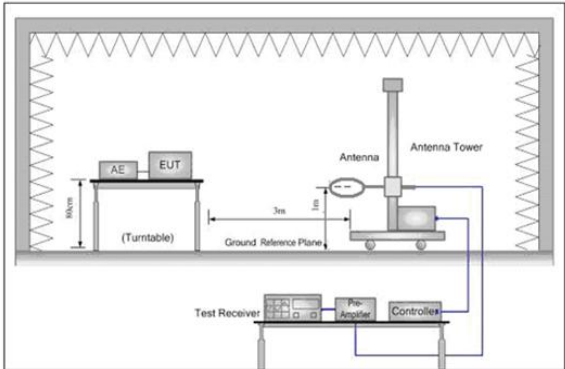


Figure 1. Below 30MHz

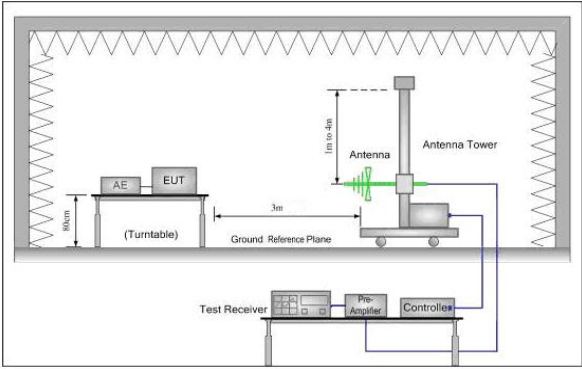


Figure 2. 30MHz to 1GHz

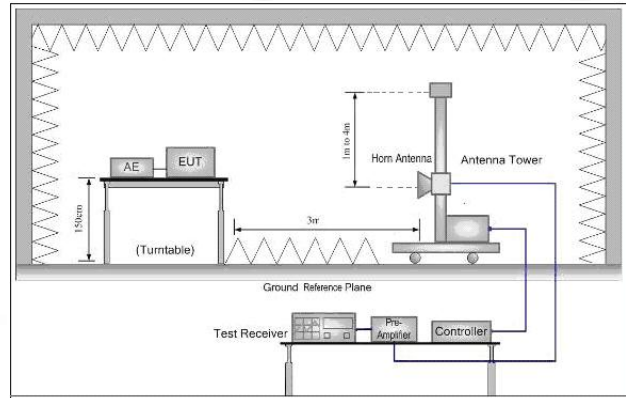


Figure 3. Above 1GHz

Test Procedure:

Below 1GHz test procedure as below:

The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.

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

The antenna height is varied from one meter to four meters above the ground to determine the maximum value of the field strength. Both horizontal and vertical polarizations of the antenna are set to make the measurement.

For each suspected emission, the EUT was arranged to its worst case and then the antenna was tuned to heights from 1 meter to 4 meters (for the test frequency of below 30MHz, the antenna was tuned to heights 1 meter) and the rota table table was turned from 0 degrees to 360 degrees to find the maximum reading.

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

If the emission level of the EUT in peak mode was 10dB lower than the limit specified, then testing could be stopped and the peak values of the EUT would be reported. Otherwise the emissions that did not have 10dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

Above 1GHz test procedure as below:

Different between above is the test site, change from Semi- Anechoic Chamber to fully Anechoic Chamber and change form table 0.8 metre to 1.5 metre(Above 18GHz the distance is 1 meter and table is 1.5 metre).

Test the EUT in the only channel .

The radiation measurements are performed in X, Y, Z axis positioning for Transmitting mode, and found the X axis positioning which it is worse case.

Repeat above procedures until all frequencies measured was complete.

Transmitting mode

Test Mode:

Test Results:

Pass

Test data:
Field Strength of the Fundamental Signal:

Average value:	
Calculate Formula:	Average value=Peak value + PDCF
	PDCF=20*log(Duty cycle)
	Duty cycle= T on time / T period
Test data:	T on time =53.334ms
	T period =100ms
	PDCF= -5.46

Test channel:	CH1
---------------	-----

Antenna polarization: Horizontal

Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
915	54.98	26.01	80.99	114.00	-33.01	Peak
915	-	-	75.53	94.00	-18.47	Average

Antenna polarization: Vertical

Frequency (MHz)	Read Level (dBuV)	Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
915	42.43	26.01	68.44	114.00	-45.56	Peak
915	-	-	62.98	94.00	-31.02	Average

Remark:

The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

Spurious Emissions

9KHz-30MHz:

9 kHz~30 MHz Field Strength of Unwanted Emissions. Quasi-Peak Measurement

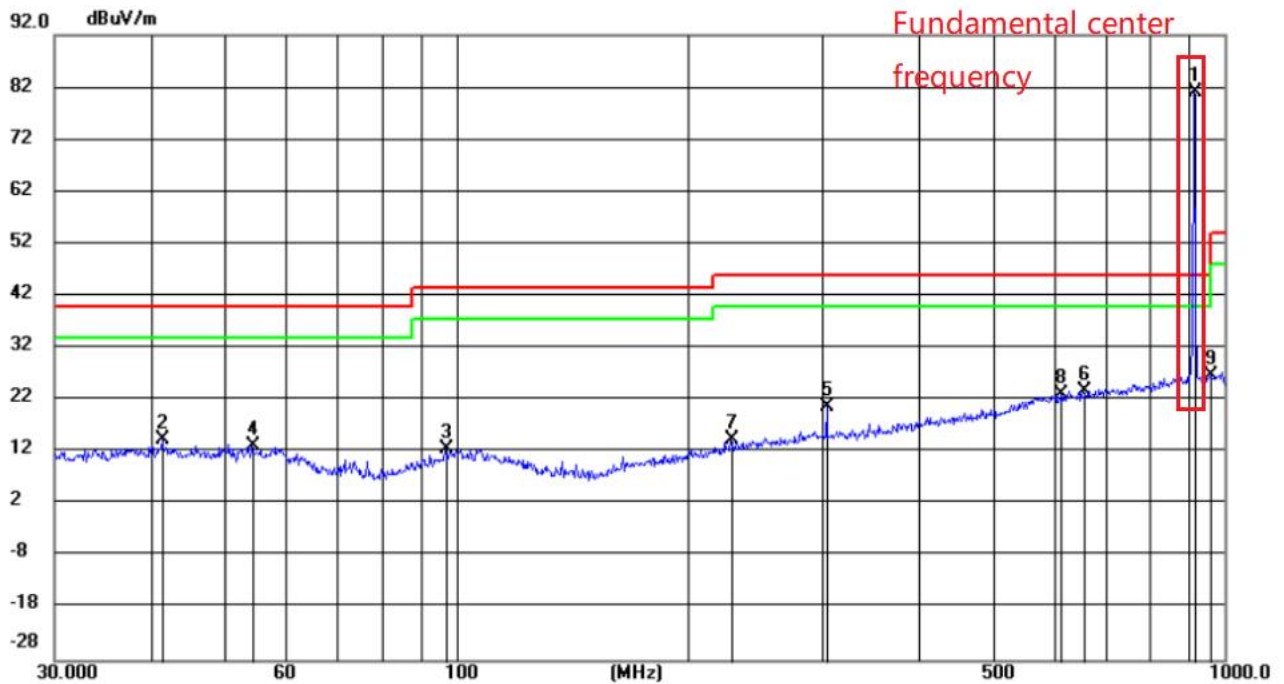
The measurements with active loop antenna were greater than 20dB below the limit, so the test data were not recorded in the test report.

30MHz-1GHz & Restricted bands:

Test channel:

CH1

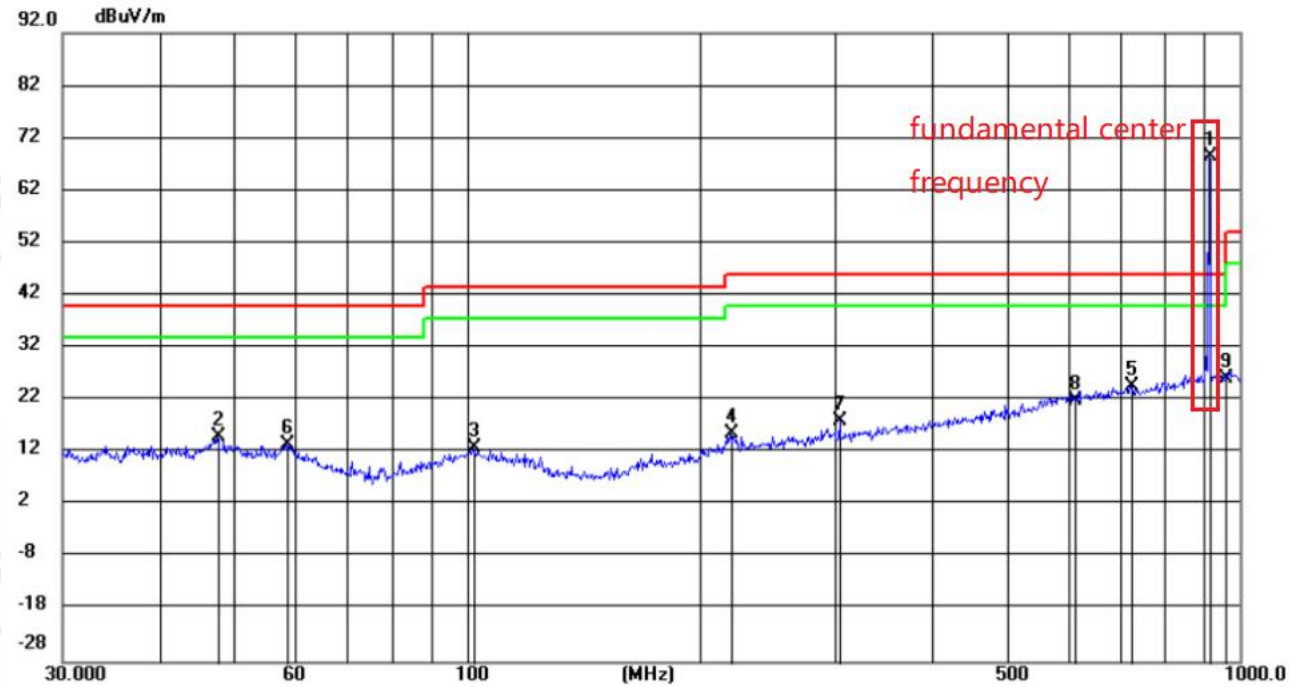
Horizontal:



No.	Mk.	Freq. MHz	Reading Level dBuV	Correct Factor dB	Measure- ment dBuV/m	Limit dBuV/m	Margin dB	Detector	Antenna Height cm	Table Degree degree	Comment
1	*	915.1055	54.98	26.01	80.99	46.00	34.99	peak	199	253	
2		41.5306	0.77	13.70	14.47	40.00	-25.53	peak	199	7	
3		97.0297	-0.09	12.65	12.56	43.50	-30.94	peak	100	77	
4		54.3562	-0.06	13.29	13.23	40.00	-26.77	peak	199	99	
5		304.2363	4.50	16.13	20.63	46.00	-25.37	peak	100	36	
6		655.7246	1.12	22.61	23.73	46.00	-22.27	peak	199	48	
7		228.2902	0.86	13.49	14.35	46.00	-31.65	peak	199	326	
8		614.0000	0.74	22.35	23.09	46.00	-22.91	peak	199	7	
9		960.0000	0.42	26.27	26.69	46.00	-19.31	peak	100	332	

Note: No.1 is the fundamental center frequency point of product operation.

Vertical:



No.	Mk.	Freq.	Reading	Correct	Measure-	Limit	Margin	Antenna	Table	
		MHz	Level	Factor	ment			Height	Degree	
			dBuV	dB	dBuV/m	dBuV/m	dB	Detector	cm	degree
1	*	915.1055	42.43	26.01	68.44	46.00	22.44	peak	100	7
2		47.5334	1.48	13.58	15.06	40.00	-24.94	peak	100	254
3		102.1445	-0.13	13.17	13.04	43.50	-30.46	peak	100	347
4		219.4213	2.38	13.17	15.55	46.00	-30.45	peak	200	26
5		724.1341	1.27	23.28	24.55	46.00	-21.45	peak	100	161
6		58.5202	0.64	13.03	13.67	40.00	-26.33	peak	200	312
7		304.1830	1.79	16.13	17.92	46.00	-28.08	peak	100	7
8		614.0000	-0.53	22.35	21.82	46.00	-24.18	peak	200	220
9		960.0000	-0.06	26.27	26.21	46.00	-19.79	peak	200	271

Note: No.1 is the fundamental center frequency point of product operation.

Above 1GHz:

Test mode:					Transmitting (CH1)				
NO	Freq. [MHz]	Factor [dB]	Reading [dBμV]	Level [dBμV/m]	Limit [dBμV/m]	Margin [dB]	Result	Polarity	Remark
1	1028.00	0.92	39.76	40.68	74.00	33.32	PASS	Horizontal	PK
2	1291.62	1.04	39.05	40.09	74.00	33.91	PASS	Horizontal	PK
3	1829.88	3.51	38.11	41.62	74.00	32.38	PASS	Horizontal	PK
4	3660.04	-20.10	63.52	43.42	74.00	30.58	PASS	Horizontal	PK
5	5490.16	-14.51	55.06	40.55	74.00	33.45	PASS	Horizontal	PK
6	6405.22	-12.85	56.92	44.07	74.00	29.93	PASS	Horizontal	PK
7	1270.82	0.98	38.67	39.65	74.00	34.35	PASS	Vertical	PK
8	1845.68	3.62	37.99	41.61	74.00	32.39	PASS	Vertical	PK
9	3660.04	-20.10	57.90	37.80	74.00	36.20	PASS	Vertical	PK
10	4575.10	-16.76	54.33	37.57	74.00	36.43	PASS	Vertical	PK
11	5490.16	-14.51	52.33	37.82	74.00	36.18	PASS	Vertical	PK
12	9210.41	-7.89	48.43	40.54	74.00	33.46	PASS	Vertical	PK

Remark:

- 1) The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:
 Final Test Level = Receiver Reading + Correct Factor
 Correct Factor = Antenna Factor + Cable Factor - Preamplifier Factor
- 2) Scan from 9kHz to 18GHz, below 30MHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed. The amplitude of spurious emissions from the radiator which are attenuated more than 20dB below the limit need not be reported .

6.2.3 20dB Bandwidth

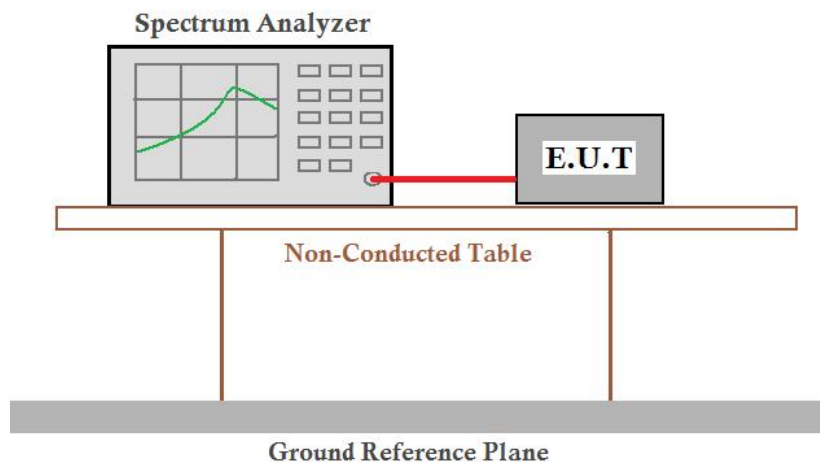
Test Requirement:

47 CFR Part 15C Section 15.215

Test Method:

ANSI C63.10: 2013

Test Setup:



Remark: Offset=Cable loss+ attenuation factor.

Test Procedure:

- 1) The RF output of EUT was connected to the spectrum analyzer by RF cable and attenuator. The path loss was compensated to the results for each measurement.
- 2) Set to the maximum power setting and enable the EUT transmit continuously.
- 3) Use the following spectrum analyzer settings for 20dB Bandwidth measurement.
Span = approximately 2 to 5 times the 20 dB bandwidth, centered on a test channel; $1\% \leq RBW \leq 5\%$ of the 20 dB bandwidth; $VBW \geq 3RBW$;
Sweep = auto; Detector function = peak; Trace = max hold.
- 4) Measure and record the results in the test report.

Limit:

N/A

Test Mode:

Transmitter mode

Test Results:

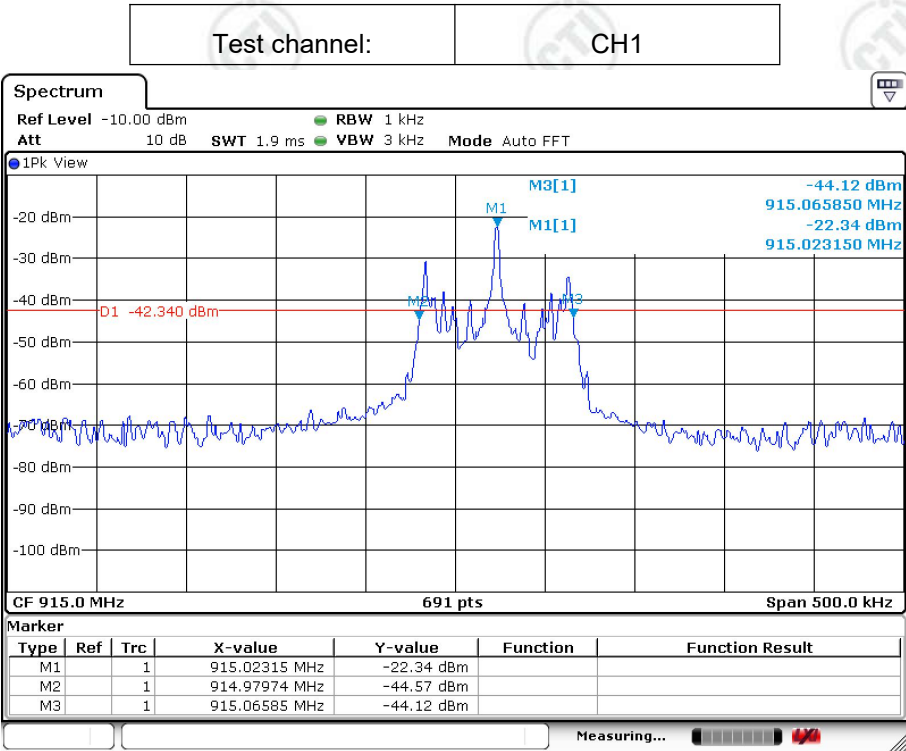
Pass

Measurement Data

Test Channel	Frequency Left (MHz)	Frequency Right (MHz)	20dB bandwidth (kHz)	Limit (kHz)	Results
CH1	914.97974	915.06585	86.11	N/A	Pass

Note: 20dB bandwidth=Frequency Right-Frequency Left;

Test plot as follows:



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