FCC RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.231+ IC RSS-210 Issue 9**
Trade name	**ARC**
Product name	**Industrial radio remote control system**
Model No.	**FLEX 8EPV**
Operation Freq.	**433.00MHz – 440.00MHz**
Test Result	**Pass**
Statements of Conformity	**Determination of compliance is based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.**

The test Result was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were given in ANSI C63.10: 2013 and compliance standards.

The test results of this report relate only to the tested sample (EUT) identified in this report.
The test Report of full or partial shall not copy. Without written approval of SGS Compliance Certification Services Inc. (Wugu Laboratory)

Approved by:

Kevin Tsai
Deputy Manager

Reviewed by:

Dally Hong
Engineer

Revision History

Rev.	Issue Date	Revisions	Effect page	Revised By
00	July 25, 2019	Initial Issue	ALL	Allison Chen
01	September 16, 2019	See the following note Rev.(01)	P.4-6, P.8, P.10-11, P.16-18, P.20-24, P.26, P.30-39	Allison Chen
02	September 25, 2019	See the following note Rev.(02)	P.8-9, P.14, P.16, P.20-24, P.30-37	Allison Chen
03	November 6, 2019	See the following note Rev.(03)	P.1, P.4, P.A-3	Allison Chen
04	November 7, 2019	See the following note Rev.(04)	P.27, P.30-37	Allison Chen

Rev.(01)

1. Modify number of frequencies to be tested and channel list in section 1.2
2. Modify the equipment cali.in section 1.6.
3. Modify test summery in section 2 and rf filed strength in section 3.1.
4. Modify test data in section 4.2, 4.3, 4.4, 4.5.
5. Modify test limit in section 4.4.1.

Rev.(02)

1. Modify instrument calibration in section 1.6.
2. Modify test procedure RBW=10kHz in section 4.2.
3. Modify duty factor in section 3.4, 4.3 and 4.4.

Rev.(03)

1. Modify model name.
2. Modify test setup photo for conducted emission.

Rev.(04)

1. Added description for duty factor.

Table of contents

1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	ADVANCED RADIOTECH CORPORATION No. 3, South 1st Road, Chien Chen District, Kaohsiung City, Taiwan
Manufacturer	ADVANCED RADIOTECH CORPORATION No. 3, South 1st Road, Chien Chen District, Kaohsiung City, Taiwan
Equipment	Industrial radio remote control system
Model Name	FLEX 8EPV
Model Discrepancy	N/A
Received Date	April 22, 2019
Date of Test	May 23 ~ September 12, 2019
Periodic operation	☒ (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. ☐ (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation ☐ (3) Periodic transmissions at regular predetermined intervals are not permitted. ☐ (4) Periodic transmissions (lower field strength): each transmission is not greater than 1 sec and the silent period between transmissions is at least 30 times the duration of the transmission but in no case less than 10 sec.
Power Operation	Power from battery: DC 3V
Operation Frequency	433.00MHz – 440.00 MHz
S/W Version	V1.1.1
H/W Version	V.01.01
Remark	1. Using the same FCC ID (R4UARCFLEXEPV) & IC (5097A-FLEXEPV) with the test report (T190422W04-A-RP and T190422W04-B-RP). 2. Transmitter (FLEX 8EPV and FLEX 12EPV) is difference between number of buttons, but using same module and same receiver.

1.2 EUT CHANNEL INFORMATION

Frequency Range	433.00-440.00 MHz
Modulation Type	GFSK
Bandwidth	50 KHz
Number of Channels	141 channels

Remark:
Refer as ANSI 63.10:2013 clause 5.6.1 Table 4 for test channels

Number of frequencies to be tested		
Frequency range in which device operates	**Number of frequencies**	**Location in frequency range of operation**
☐ 1 MHz or less	1	Middle
☒ 1 MHz to 10 MHz	2	1 near top and 1 near bottom
☐ More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

Channel List

CH	Freq.(MHz)	CH	Freq.(MHz)	CH	Freq.(MHz)	CH	Freq.(MHz)	CH	Freq.(MHz)
1	433.000	31	434.50	61	436.000	91	437.500	121	439.000
2	433.050	32	434.55	62	436.050	92	437.550	122	439.050
3	433.100	33	434.60	63	436.100	93	437.600	123	439.100
4	433.150	34	434.65	64	436.150	94	437.650	124	439.150
5	433.200	35	434.70	65	436.200	95	437.700	125	439.200
6	433.250	36	434.75	66	436.250	96	437.750	126	439.250
7	433.300	37	434.80	67	436.300	97	437.800	127	439.300
8	433.350	38	434.85	68	436.350	98	437.850	128	439.350
9	433.400	39	434.90	69	436.400	99	437.900	129	439.400
10	433.450	40	434.95	70	436.450	100	437.950	130	439.450
11	433.500	41	435.00	71	436.500	101	438.000	131	439.500
12	433.550	42	435.05	72	436.550	102	438.050	132	439.550
13	433.600	43	435.10	73	436.600	103	438.100	133	439.600
14	433.650	44	435.15	74	436.650	104	438.150	134	439.650
15	433.700	45	435.20	75	436.700	105	438.200	135	439.700
16	433.750	46	435.25	76	436.750	106	438.250	136	439.750
17	433.800	47	435.30	77	436.800	107	438.300	137	439.800
18	433.850	48	435.35	78	436.850	108	438.350	138	439.850
19	433.900	49	435.40	79	436.900	109	438.400	139	439.900
20	433.950	50	435.45	80	436.950	110	438.450	140	439.950
21	434.000	51	435.50	81	437.000	111	438.500	141	440.000
22	434.050	52	435.55	82	437.050	112	438.550		
23	434.100	53	435.60	83	437.100	113	438.600		
24	434.150	54	435.65	84	437.150	114	438.650		
25	434.200	55	435.70	85	437.200	115	438.700		
26	434.250	56	435.75	86	437.250	116	438.750		
27	434.300	57	435.80	87	437.300	117	438.800		
28	434.350	58	435.85	88	437.350	118	438.850		
29	434.400	59	435.90	89	437.400	119	438.900		
30	434.450	60	435.95	90	437.450	120	438.950		

1.3 ANTENNA INFORMATION

Antenna Type	☐ PIFA ☒ PCB ☐ Dipole ☐ Printed ☐ Coils
Antenna Gain	0 dBi
Antenna Connector	N/A

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 0.0014
RF output power, conducted	+/- 1.14
Power density, conducted	+/- 1.40
3M Semi Anechoic Chamber / 30M~200M	+/- 4.12
3M Semi Anechoic Chamber / 200M~1000M	+/- 4.68
3M Semi Anechoic Chamber / 1G~8G	+/- 5.18
3M Semi Anechoic Chamber / 8G~18G	+/- 5.47
3M Semi Anechoic Chamber / 18G~26G	+/- 3.81
3M Semi Anechoic Chamber / 26G~40G	+/- 3.87

Remark:
1.This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2
2. ISO/IEC 17025 requires that an estimate of the measurement uncertainties associated with the emissions test results be included in the report.

1.5 FACILITIES AND TEST LOCATION

All measurement facilities used to collect the measurement data are located at

No.11, Wugong 6th Rd., Wugu Dist., New Taipei City 24891, Taiwan. (R.O.C.)

Test site	Test Engineer	Remark
AC Conduction Room	-	Not applicable, because EUT doesn't connect to AC Main Source direct.
Radiation	Jerry Lu	-
RF Conducted	Dally Hong	-

Remark: *The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.*

1.6 INSTRUMENT CALIBRATION

RF Conducted Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Coaxial Cable	Woken	WC12	CC003	06/28/2019	06/27/2020
Signal Analyzer	R&S	FSV 40	101073	09/27/2018	09/26/2019
Software	N/A				

For Section 3.4: Test date: May 23, 2019

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/13/2018	07/12/2019
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	02/26/2019	02/25/2020
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	08/20/2018	08/19/2019
High Pass Filter	SOLVANG TECHNOLOGY INC.	STI15	9923	02/26/2019	02/25/2020
Loop Ant	COM-POWER	AL-130	121051	03/22/2019	03/21/2020
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/31/2018	05/30/2019
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

Remark: *Each piece of equipment is scheduled for calibration once a year.*

For Section 4.3, 4.4: Test date: September 11, 2019

3M 966 Chamber Test Site					
Equipment	**Manufacturer**	**Model**	**S/N**	**Cal Date**	**Cal Due**
Bilog Antenna	Sunol Sciences	JB3	A030105	07/26/2019	07/25/2020
Cable	HUBER SUHNER	SUCOFLEX 104PEA	25157	02/26/2019	02/25/2020
Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020
High Pass Filter	SOLVANG TECHNOLOGY INC.	STI15	9923	02/26/2019	02/25/2020
Horn Antenna	ETS LINDGREN	3117	00143280	07/16/2019	07/15/2020
Loop Ant	COM-POWER	AL-130	121051	03/22/2019	03/21/2020
Pre-Amplifier	EMEC	EM330	060609	02/26/2019	02/25/2020
Pre-Amplifier	HP	8449B	3008A00965	02/26/2019	02/25/2020
PSA Series Spectrum Analyzer	Agilent	E4446A	MY46180323	05/29/2019	05/28/2020
Antenna Tower	CCS	CC-A-1F	N/A	N.C.R	N.C.R
Controller	CCS	CC-C-1F	N/A	N.C.R	N.C.R
Turn Table	CCS	CC-T-1F	N/A	N.C.R	N.C.R
Software	e3 6.11-20180413				

Remark: *Each piece of equipment is scheduled for calibration once a year.*

1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT

There are no accessories and support equipment be used during the test.

EUT Accessories Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

Support Equipment					
No.	**Equipment**	**Brand**	**Model**	**Series No.**	**FCC ID**
	N/A				

1.8 TEST METHODOLOGY AND APPLIED STANDARDS

The test methodology, setups and results comply with all requirements in accordance with ANSI C63.10:2013, FCC 15.231, IC RSS-210, IC RSS-Gen Rules.

2. TEST SUMMERY

FCC Standard Sec.	IC Standard Sec.	Chapter	Test Item	Result
15.203	RSS-GEN Sec. 8.3	1.3	Antenna Requirement	Pass
15.207	RSS-GEN Sec. 8.8	4.1	AC Power-line Conducted Emission	Not applicable
15.231(c)	RSS-210 A.1.3	4.2	Emission Bandwidth	Pass
15.231(b)	RSS-210 A.1.2	4.3	Fundamental Emission	Pass
15.209(b)	RSS-GEN Sec. 8.9	4.4	Transmitter Radiated Emission	Pass
15.231(a)(1)	RSS-210 A.1.1	4.5	Operation Restriction	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	433.00 MHz -440.00MHz
RF Filed strength	Peak: 99.67 dBuv/m Average : 75.24 dBuv/m

Remark: Field strength performed Average level at 3m.

3.2 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Above 1G	
Test Condition	**Band edge, Emission for Unwanted and Fundamental**
Power supply Mode	**Mode 1:EUT power by Battery 3 v**
Worst Mode	**☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4**
Worst Position	**☐ Placed in fixed position.** **☐ Placed in fixed position at X-Plane (E2-Plane)** **☐ Placed in fixed position at Y-Plane (E1-Plane)** **☒ Placed in fixed position at Z-Plane (H-Plane)**
Worst Polarity	**☒ Horizontal ☒ Vertical**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1:EUT power by Battery 3 v**
Worst Mode	**☒ Mode 1 ☐ Mode 2 ☐ Mode 3 ☐ Mode 4**

Remark:
1. The worst mode was record in this test report.
2. EUT pre-scanned in three axis ,X,Y, Z and two polarity, Horizontal and Vertical for radiated measurement. The worst case(Z-Plane) were recorded in this report

3.3 FCC PART 15.205 RESTRICTED BANDS OF OPERATIONS

According to FCC 15.231(b), 15.231(e),

(b) In addition to the provisions of §15.205, the field strength of emissions from intentional radiators operated under this section shall not exceed the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

(1) The above field strength limits are specified at a distance of 3 meters. The tighter limits apply at the band edges.

(2) Intentional radiators operating under the provisions of this section shall demonstrate compliance with the limits on the field strength of emissions, as shown in the above table, based on the average value of the measured emissions. As an alternative, compliance with the limits in the above table may be based on the use of measurement instrumentation with a CISPR quasi-peak detector. The specific method of measurement employed shall be specified in the application for equipment authorization. If average emission measurements are employed, the provisions in §15.35 for averaging pulsed emissions and for limiting peak emissions apply. Further, compliance with the provisions of §15.205 shall be demonstrated using the measurement instrumentation specified in that section.

(3) The limits on the field strength of the spurious emissions in the above table are based on the fundamental frequency of the intentional radiator. Spurious emissions shall be attenuated to the average (or, alternatively, CISPR quasi-peak) limits shown in this table or to the general limits shown in §15.209, whichever limit permits a higher field strength.

(e) Intentional radiators may operate at a periodic rate exceeding that specified in paragraph (a) of this section and may be employed for any type of operation, including operation prohibited in paragraph (a) of this section, provided the intentional radiator complies with the provisions of paragraphs (b) through (d) of this section, except the field strength table in paragraph (b) of this section is replaced by the following:

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500[1]	50 to 150[1]
174-260	1,500	150
260-470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

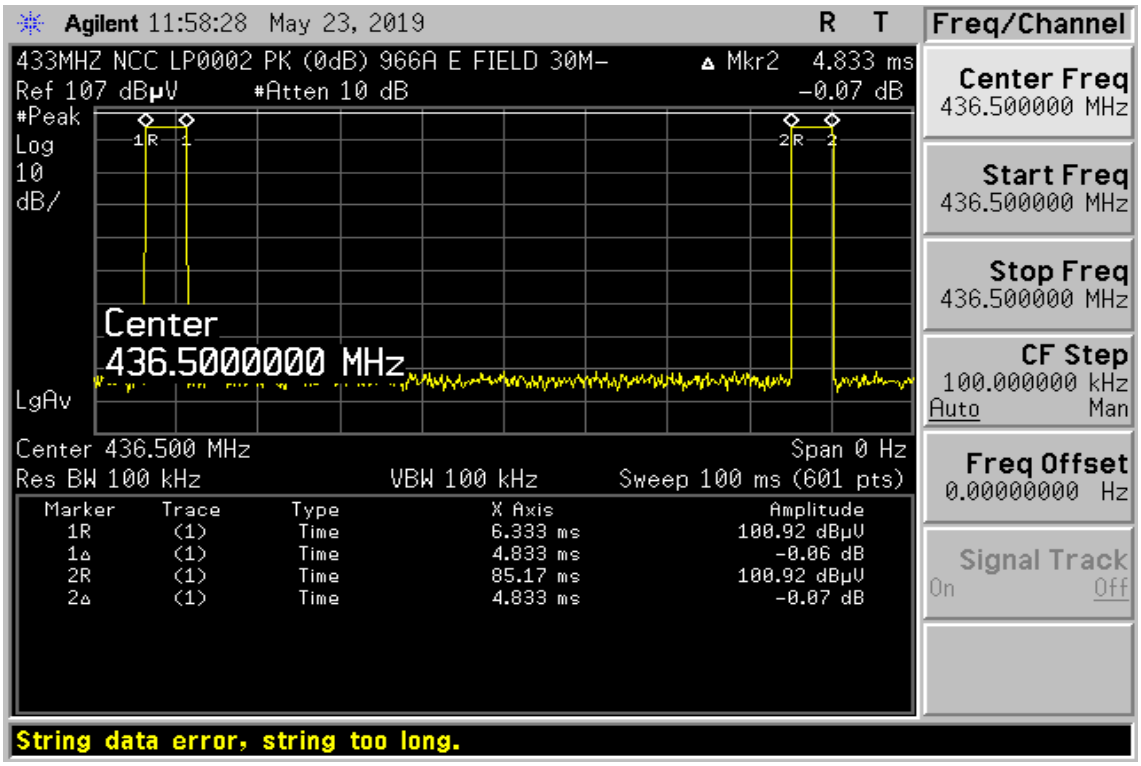
[1]Linear interpolations.

In addition, devices operated under the provisions of this paragraph shall be provided with a means for automatically limiting operation so that the duration of each transmission shall not be greater than one second and the silent period between transmissions shall be at least 30 times the duration of the transmission but in no case less than 10 seconds.

3.4 EUT DUTY CYCLE

433MHz - 434MHz

Duty Cycle			
TX ON (ms)	TX All(ms)	Duty Cycle	Duty Factor(dB)
4.833	78.83	6.13%	-24.25



Notes:

1. The transmitter duty cycle was measured using a spectrum analyser in the time domain and calculated by 20 log (Time$_{(on)}$ / [Period or 100 ms whichever is the lesser])
2. The EUT transmits for a Time(on) of 4.833 milliseconds.

   20 log (Time$_{(on)}$ / [Period or 100 ms whichever is the lesser]).

   20 log (4.833/78.83) = -24.25dB

4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a), RSS-Gen Sec.8.8,

Frequency Range (MHz)	Limits(dBμV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50

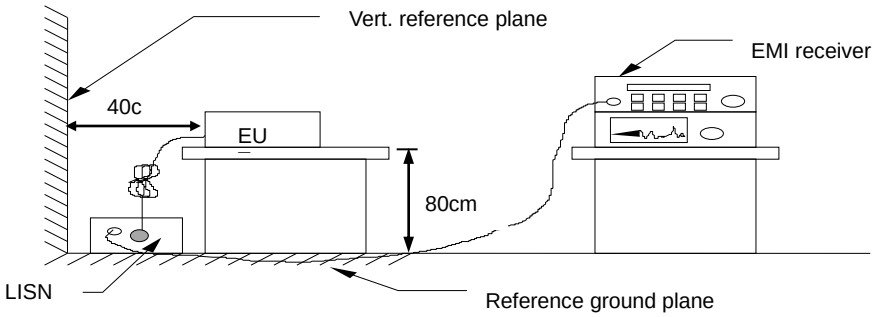
* Decreases with the logarithm of the frequency.

4.1.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.2,

1. The EUT was placed on a table, which is 0.8m above ground plane.
2. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
3. Repeat above procedures until all frequency measured were complete

4.1.3 Test Setup



4.1.4 Test Result

Not applicable

4.2 EMISSION BANDWIDTH

4.2.1 Test Limit

According to §15.231(c), RSS-210 A.1.3 ,

Limit	☒ 70 MHz – 900 MHz : Fc * 0.25 % ☐ Above 900 MHz : Fc * 0. 5 %

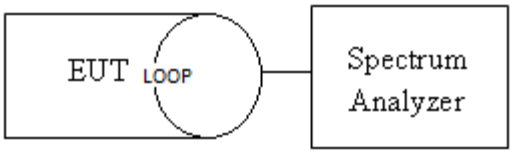
4.2.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 6.9.2,

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. Set the RBW=10KHz, VBW=30KHz, Detector = Peak, Trace mode = Max hold, Sweep = Auto. Measure the maximum width of the emission that is constrained by the frequencies associated with the 20dB Bandwidth.

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. SA set RBW = 1% ~ 5% OBW, VBW = three times the RBW and Detector = Peak, Trace mode = Max hold, Sweep = Auto. Measure the maximum width of the emission that is constrained by the frequencies associated with the Occupied Bandwidth (99%).

4.2.3 Test Setup



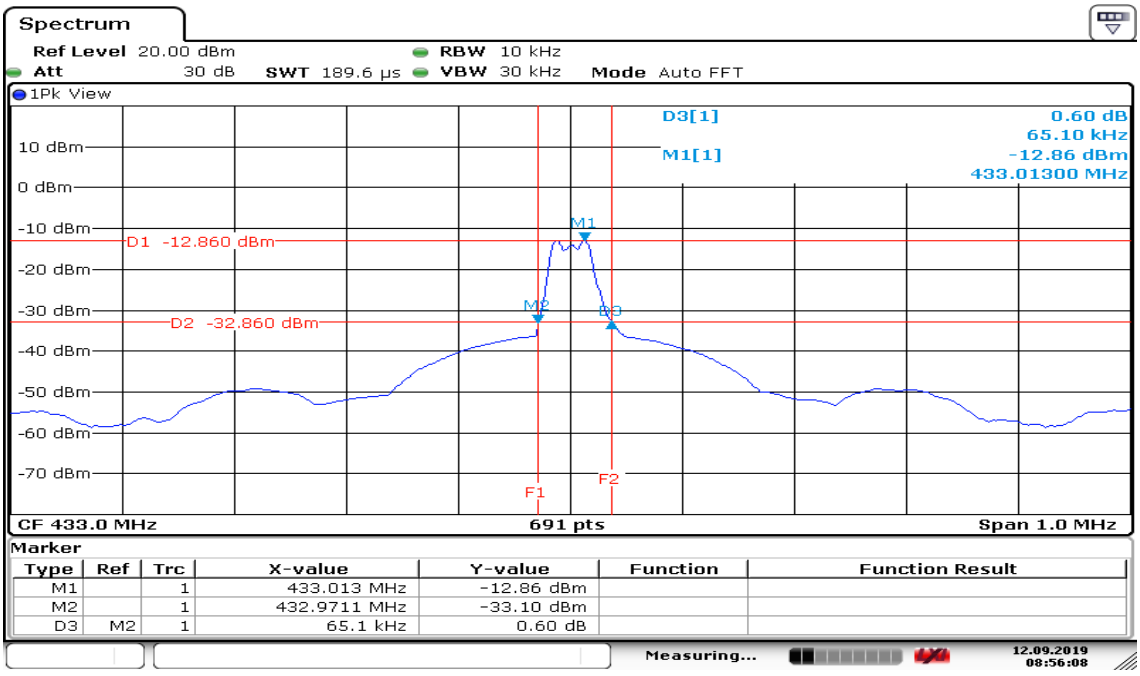
4.2.4 Test Result

Spectrum Bandwidth				
Frequency (MHz)	**20dB Bandwidth (KHz)**	**20dB Bandwidth Limits (MHz)**	**99% Occupied BW (KHz)**	**99% Bandwidth Limits (MHz)**
433	65.1	1.0825	108.538	1.0825
440	63.7	1.1000	153.400	1.1000

Test Data

433MHz

20dB Bandwidth



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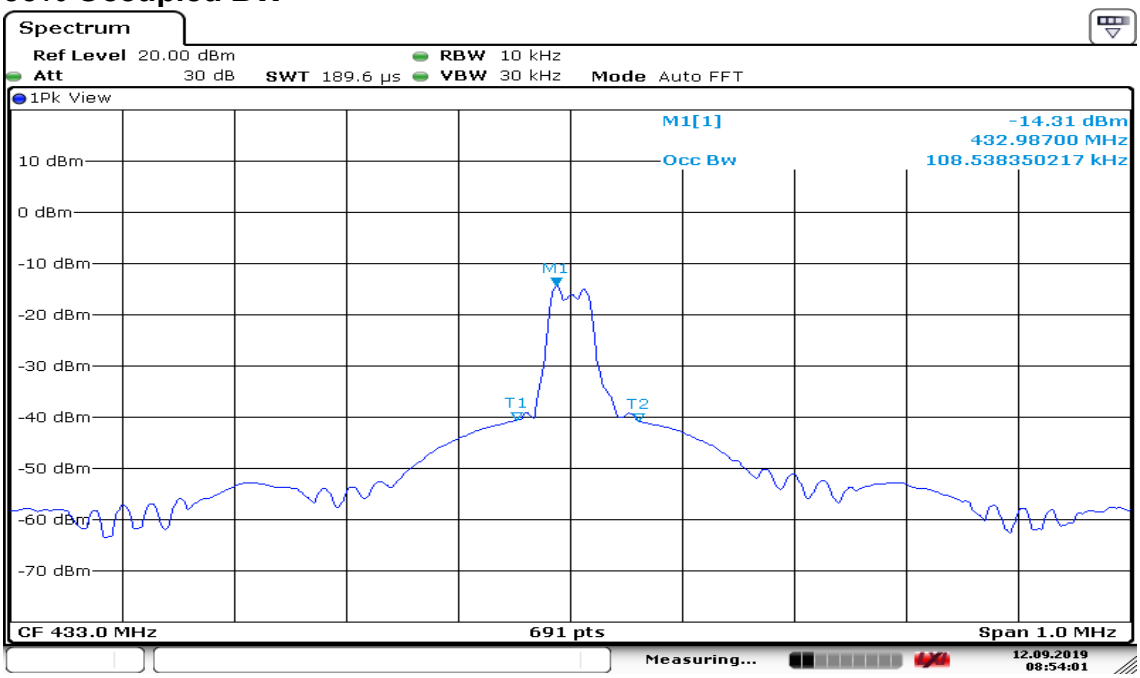
99% Occupied BW



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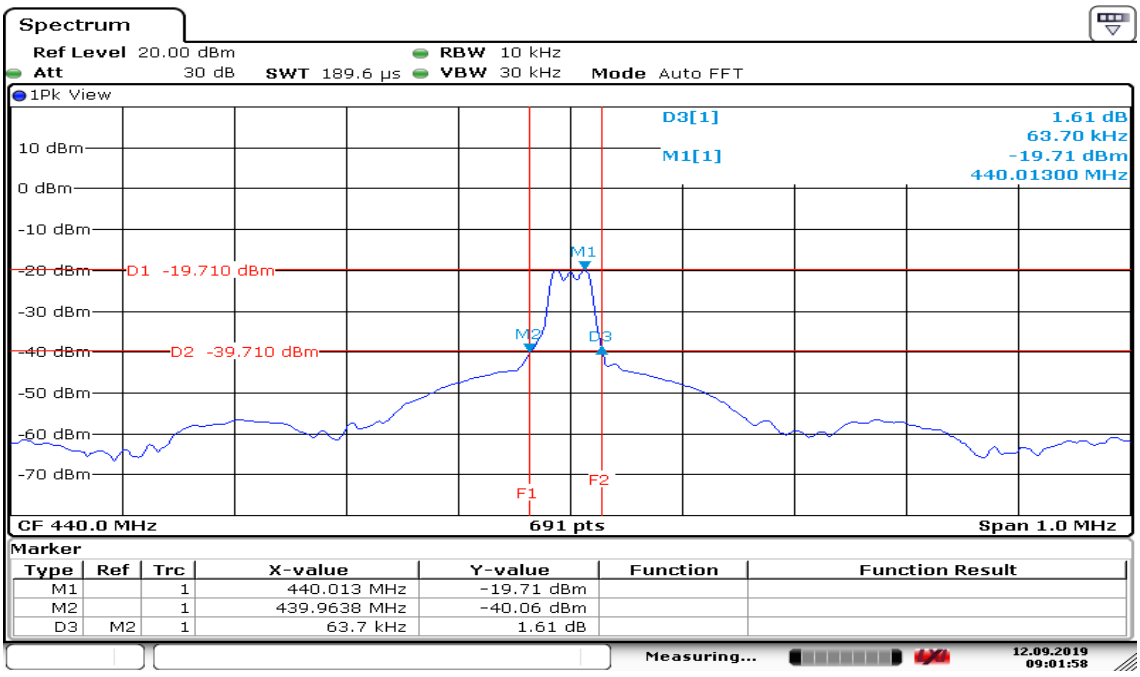
440MHz

20dB Bandwidth



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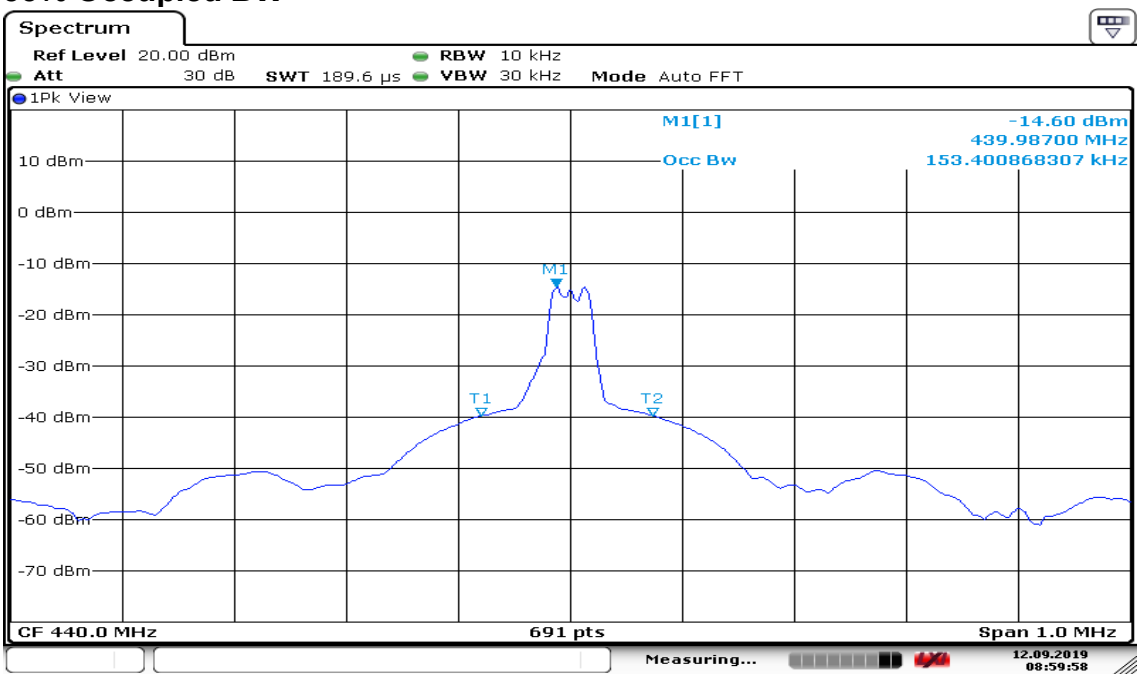
99% Occupied BW



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4.3 FIELD STRENGTH OF FUNDAMENTAL

4.3.1 Test Limit

According to §15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of fundamental (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

According to RSS-210 A.1.2

Table A1— Permissible Field Strength Limits for Momentarily Operated Devices	
Fundamental Frequency (MHz), Excluding Restricted Frequency Bands Specified in RSS-Gen	**Field Strength of the Fundamental Emissions (µV/m at 3 m)**
70-130	1,250
130-174	1,250 to 3,750*
174-260 (Note 1)	3,750
260-470 (Note 1)	3,750 to 12,500*
Above 470	12,500

* Linear interpolation with frequency, f, in MHz:
For 130-174 MHz: Field Strength (µV/m) = (56.82 × f)−6136
For 260-470 MHz: Field Strength (µV/m) = (41.67 × f)−7083

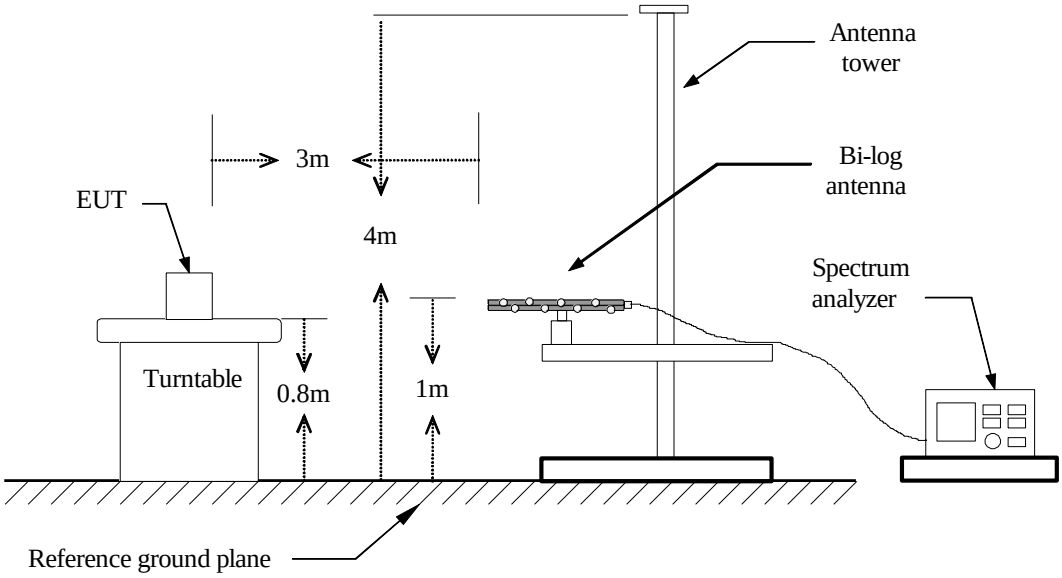
***Note 1**: Frequency bands 225-328.6 MHz and 335.4-399.9 MHz are designated for the exclusive use of the Government of Canada. Manufacturers should be aware of possible harmful interference and degradation of their licence-exempt radio equipment in these frequency bands.*

4.3.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 4.1.4 and clause 6.5

clause 4.1.4	☒ 4.1.4.2.2: Measurement Peak value. ☐ 4.1.4.2.3: Duty cycle ≥ 100%. ☒ 4.1.4.2.4: Measurement Average value.

4.3.3 Test Setup



4.3.4 Test Result

Field Strength					
Frequency (MHz)	**Fundamental (dBuV/m) at 3m**	**Limit (dBuV/m) at 3m**	**Margin (dB)**	**Axis/Pol.**	**Remark**
433	74.22	80.79	-6.57	Z/H	AVG

Remark:

1. Fundamental measured method setting on spectrum, RBW=100 kHz, VBW=100kHz and Detector=Peak.

2. Average result = Peak result + Duty factor = 98.47 dBuV/m –24.25= 74.22dBuV/m

*3. 260MHz ~ 470MHz limit is 41.6667 * (Frequency, MHz) – 7083.3333*

*Limit = 41.6667 * (433 MHz) – 7083.3333*

=10958.35 (uV/m)

dBuv/m = 20 Log(uV/m) = 20 Log (10958.35 uV/m)= 80.79dBuV/m

Field Strength					
Frequency (MHz)	**Fundamental (dBuV/m) at 3m**	**Limit (dBuV/m) at 3m**	**Margin (dB)**	**Axis/Pol.**	**Remark**
440	74.42	81.02	-5.6	Z/H	AVG

Remark:

1. Fundamental measured method setting on spectrum, RBW=100 kHz, VBW=100kHz and Detector=Peak.

2. Average result = Peak result + Duty factor = 99.67 dBuV/m –24.25= 75.42dBuV/m

*3. 260MHz ~ 470MHz limit is 41.6667 * (Frequency, MHz) – 7083.3333*

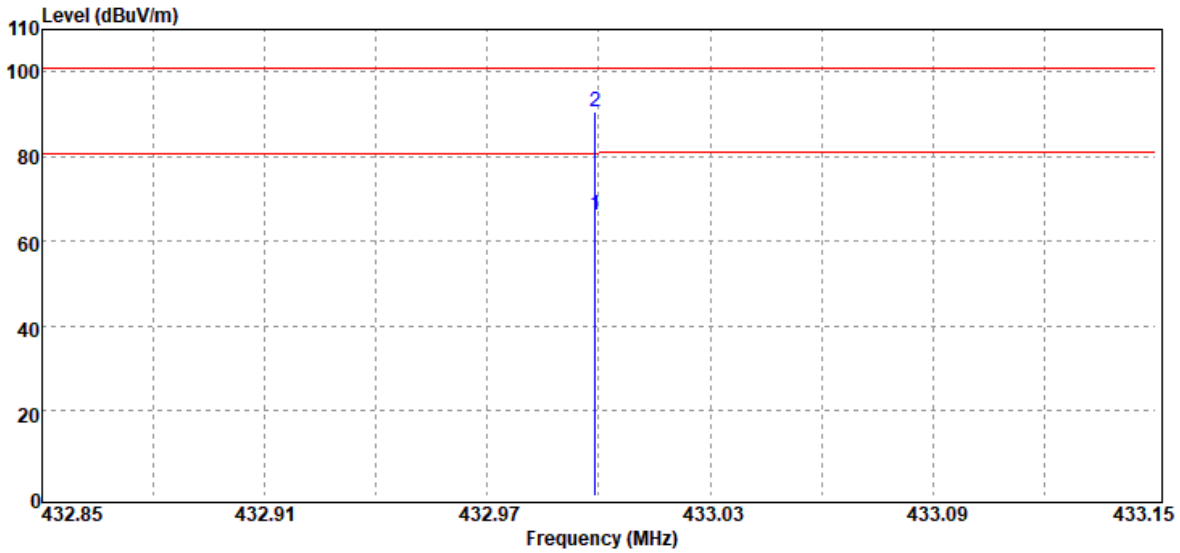
*Limit = 41.6667 * (440 MHz) – 7083.3333*

=11250.01 (uV/m)

dBuv/m = 20 Log(uV/m) = 20 Log (11250.01 uV/m)= 81.02dBuV/m

Test Data

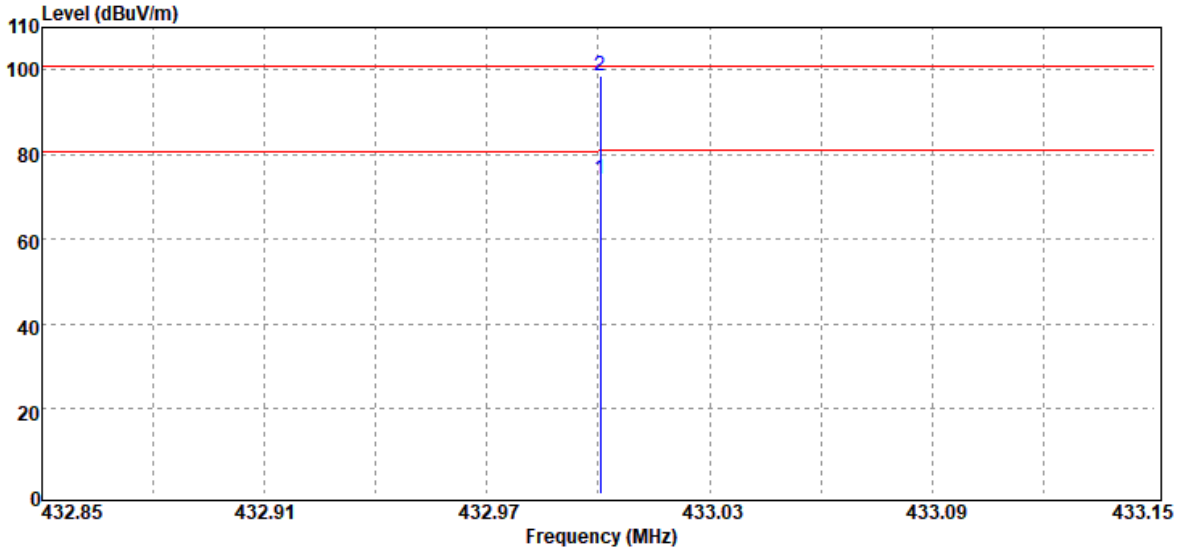
Test Mode:	TX-433MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Fundamental	Test Date	2019/09/11
Axis/Polarize	Z-Plane/Ver.	Test Engineer	Jerry Lu
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
2	433.00	Peak	94.82	-4.29	90.53	100.79	-10.26

Note:
No.1 Average result = Peak result + Duty factor = 90.53 dBuV/m –24.25= 66.28dBuV/m

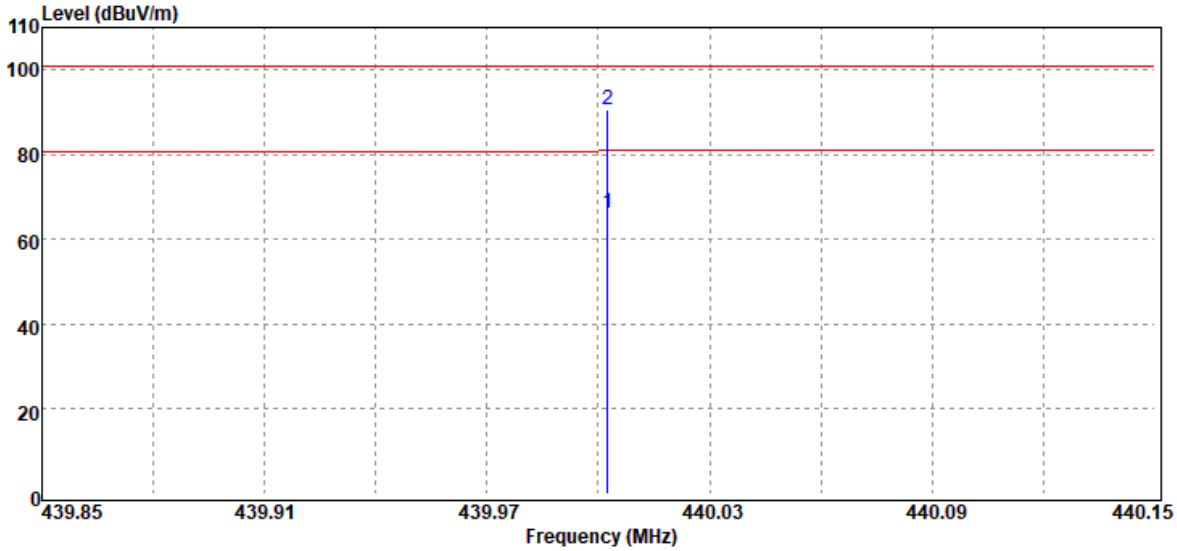
Test Mode:	TX-433MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Fundamental	Test Date	2019/09/11
Axis/Polarize	Z-Plane/Hor.	Test Engineer	Jerry Lu
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
2	433.00	Peak	102.76	-4.29	98.47	100.79	-2.32

Note:
No.1 Average result = Peak result + Duty factor = 98.47 dBuV/m –24.25= 74.22dBuV/m

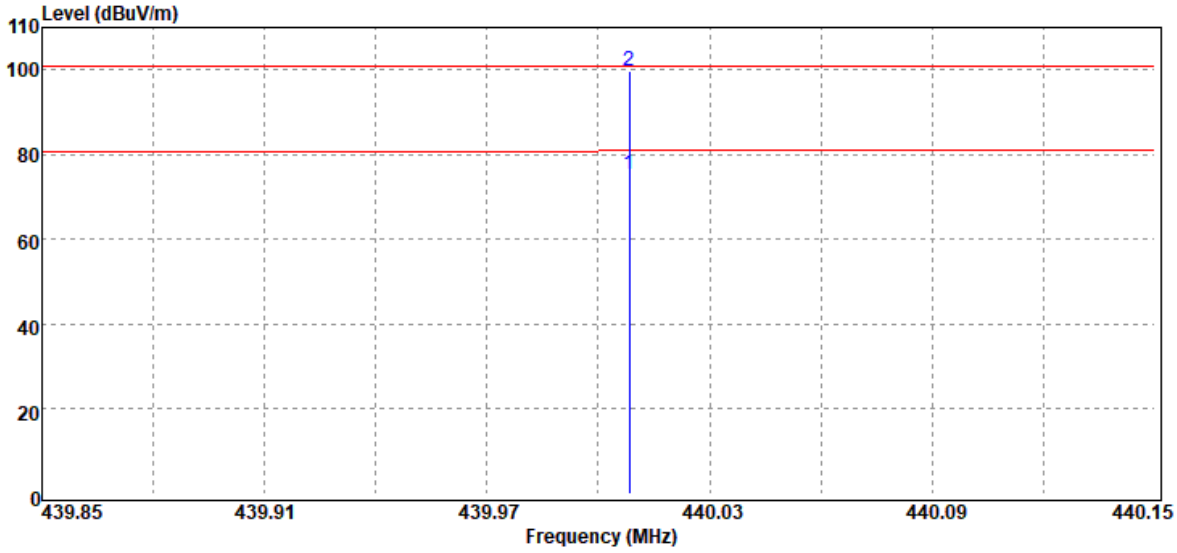
Test Mode:	TX-440MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Fundamental	Test Date	2019/09/11
Axis/Polarize	Z-Plane/Ver.	Test Engineer	Jerry Lu
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
2	440.00	Peak	94.76	-4.05	90.71	101.02	-10.31

Note:
No.1 Average result = Peak result + Duty factor = 90.71 dBuV/m –24.25= 66.46dBuV/m

Test Mode:	TX-440MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Fundamental	Test Date	2019/09/11
Axis/Polarize	Z-Plane/Hor.	Test Engineer	Jerry Lu
Detector	Peak & AVG		



No	Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
2	440.01	Peak	103.72	-4.05	99.67	101.02	-1.35

Note:
No.1 Average result = Peak result + Duty factor = 99.67 dBuV/m –24.25= 75.42dBuV/m

4.4 RADIATION UNWANTED EMISSION

4.4.1 Test Limit

According to §15.231(b) and §15.209, §15.205
Unwanted emissions limit follow the table or the FCC Part 15.209, whichever limit permits higher field strength.

According to RSS-210 A1.2 and RSS-GEN Sec. 8.9
Unwanted emissions shall comply with the general field strength limits specified in RSS-Gen or 10 times below the fundamental emissions field strength limit in table as below, whichever is less stringent.

According to §15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of fundamental (microvolts/meter)
40.66-40.70	2,250	225
70-130	1,250	125
130-174	[1]1,250 to 3,750	[1]125 to 375
174-260	3,750	375
260-470	[1]3,750 to 12,500	[1]375 to 1,250
Above 470	12,500	1,250

[1]Linear interpolations.

Below 30MHz

Frequency (MHz)	Field Strength				
	(μV/m)	(dBμV/m)	Measurement Distance (meter)	(dBμV/m)	Measurement Distance (meter)
0.009 - 0.490	2400/F(kHz)	48.52 – 13.80	300	128.52–104.84	3
0.490 - 1.705	24000/F(kHz)	33.80 – 22.97	30	73.80– 62.97	3
1.705 – 30.0	30	29.54	30	69.54	3

Above 30MHz

Frequency (MHz)	Field Strength		Measurement Distance (meter)
	(μV/m)	(dBμV/m)	
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

According to RSS-Gen, Section 8.9 and 8.10.

RSS-Gen Table 3 and Table 5 – General Field Strength Limits for Transmitters and Receivers at Frequencies Above 30 MHz (Note)

Frequency (MHz)	Field Strength microvolts/m at 3 metres (watts, e.i.r.p.)	
	Transmitters	Receivers
30-88	100 (3 nW)	100 (3 nW)
88-216	150 (6.8 nW)	150 (6.8 nW)
216-960	200 (12 nW)	200 (12 nW)
Above 960	500 (75 nW)	500 (75 nW)

Note: Measurements for compliance with the limits in table 3 may be performed at distances other than 3 metres, in accordance with Section 6.6.

RSS-Gen Table 6: General Field Strength Limits for Transmitters at Frequencies Below 30 MHz (Transmit)

Frequency	Magnetic field strength (H-Field) (μA/m)	Measurement Distance (m)
9-490 kHz Note	6.37/F (F in kHz)	300
490-1,705 kHz	63.7/F (F in kHz)	30
1.705-30 MHz	0.08	30

Note: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector..

4.4.2 Test Procedure

Test method Refer as ANSI 63.10:2013

☒ Unwanted Emission	☒ clause 4.1.4.2.2: Measurement Peak value. ☐ clause 4.1.4.2.3: Duty cycle ≥ 100%. ☒ clause 4.1.4.2.4: Measurement Average value.

☒ Radiated Emission	☒ clause 6.4: below 30 MHz and test distance is 3m. ☒ clause 6.5: below 30 MHz -1 GHz and test distance is 3m. ☒ clause 6.6: Above 30 MHz and test distance is 3m.

1. The EUT is placed on a turntable, which is 0.8m for test below 1GHz and 1.5m for test above 1GHz, above ground plane.
2. The turntable shall be rotated for 360 degrees to determine the position of maximum emission level.
3. EUT is set 3m away from the receiving antenna, which is varied from 1m to 4m to find out the highest emissions.
4. Maximum procedure was performed on the six highest emissions to ensure EUT compliance.
5. And also, each emission was to be maximized by changing the polarization of receiving antenna both horizontal and vertical.
6. Set the spectrum analyzer in the following setting as:

   Below 1GHz:

   RBW=100kHz / VBW=300kHz / Sweep=AUTO

   Above 1GHz:

   (a)PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

   (b)AVERAGE: RBW=1MHz,
7. Repeat above procedures until the measurements for all frequencies are complete.

Remark.

1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.

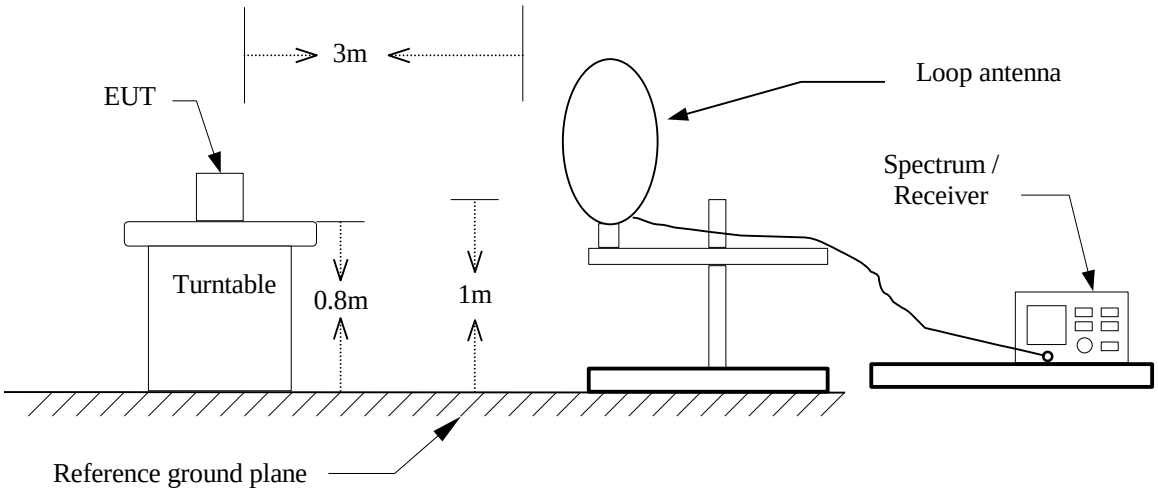
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

*3. Note ***** : Duty factor reference to section 3.4 EUT DUTY CYCLE.*

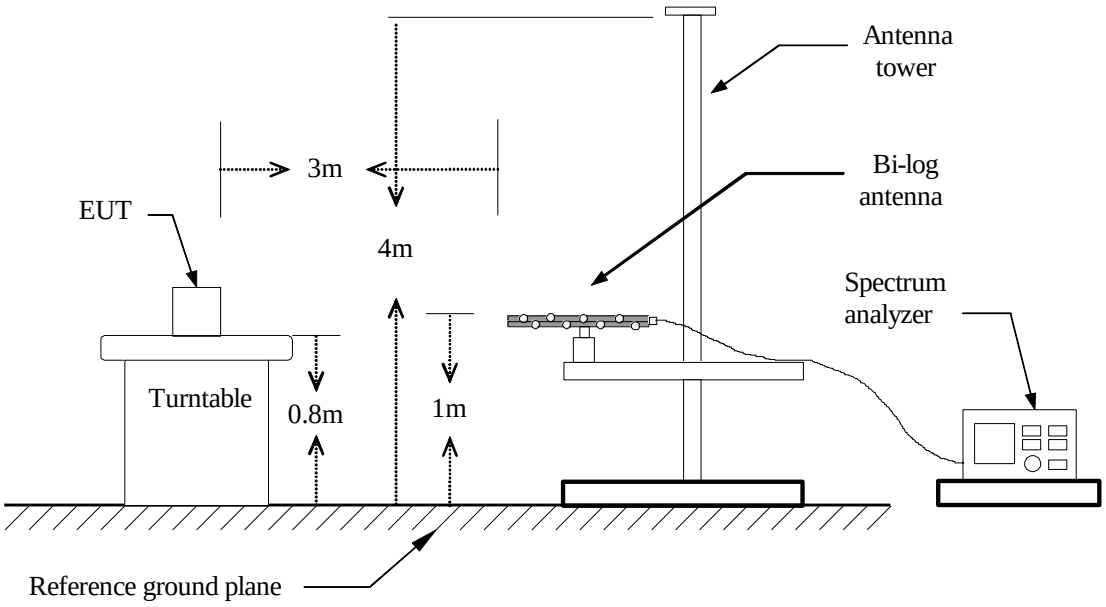
Average result = Peak result + Duty factor

4.4.3 Test Setup

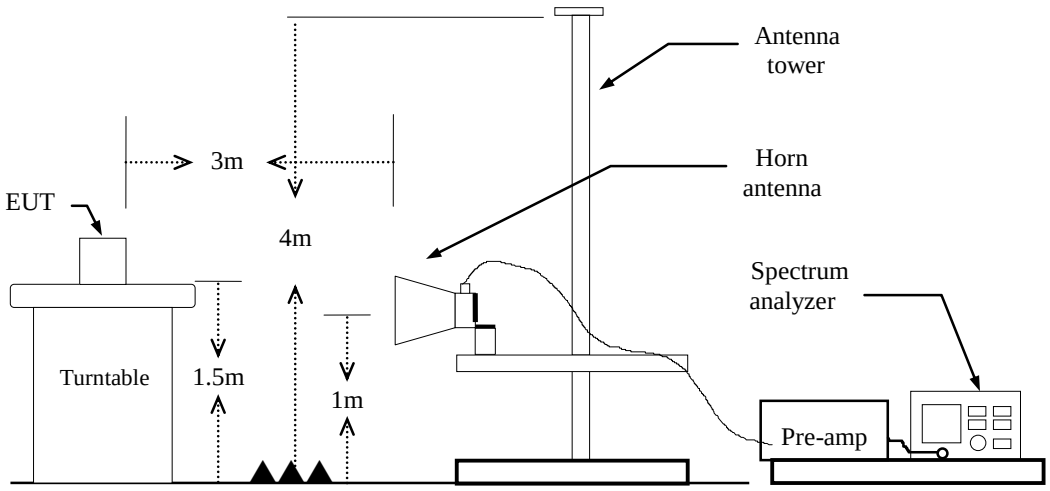
9kHz ~ 30MHz



30MHz ~ 1 GHz



Above 1 GHz



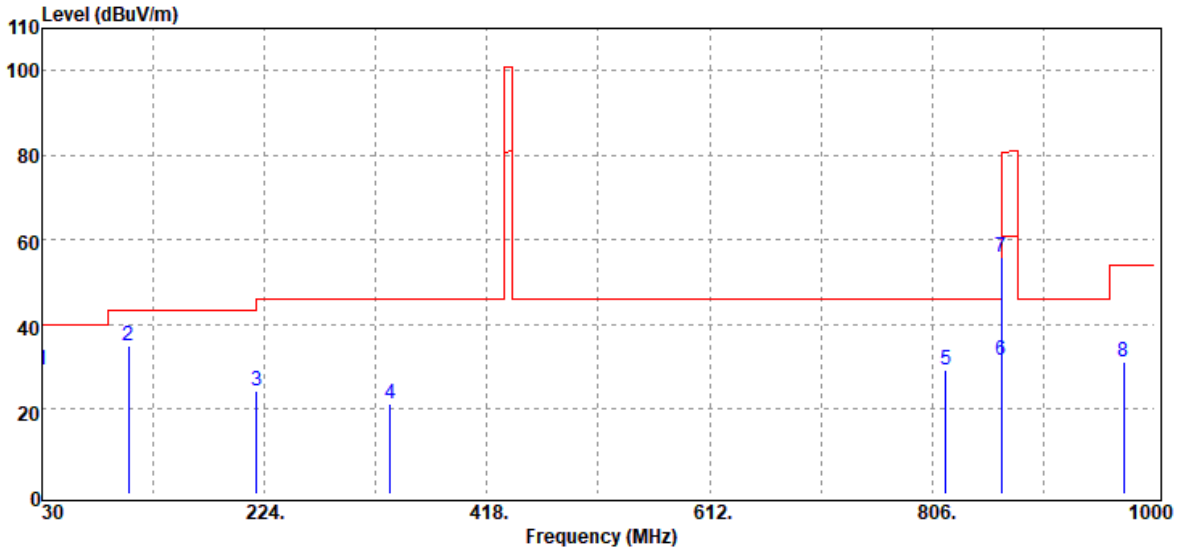
4.4.4 Test Result

Pass.

Test Data

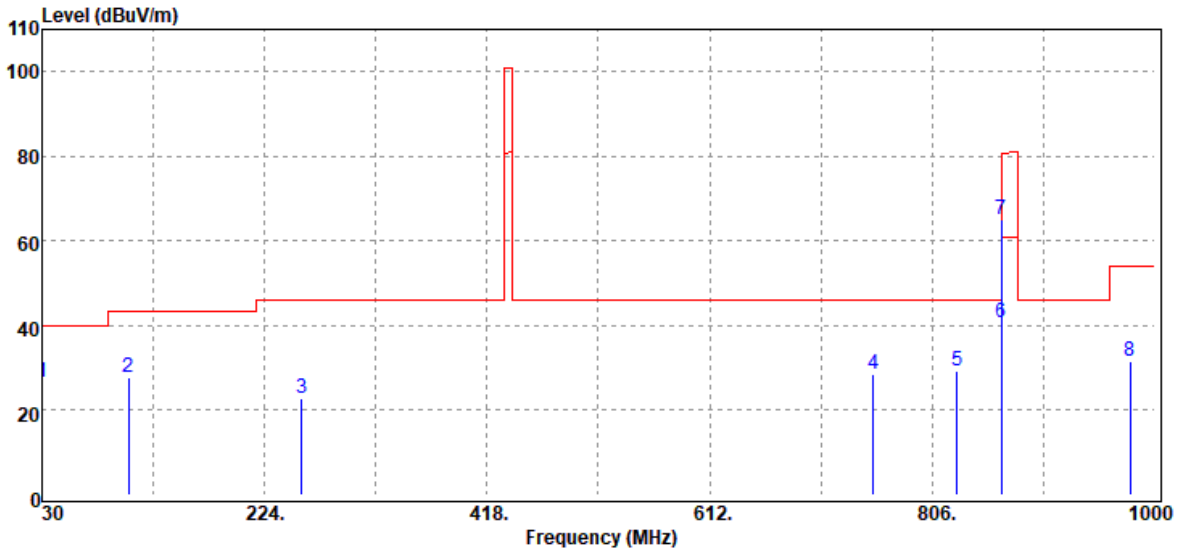
Below 1GHz

Test Mode:	TX-433MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Below 1GHz	Test Date	2019/09/11
Polarize	Vertical	Test Engineer	Jerry Lu
Detector	Peak and Average		



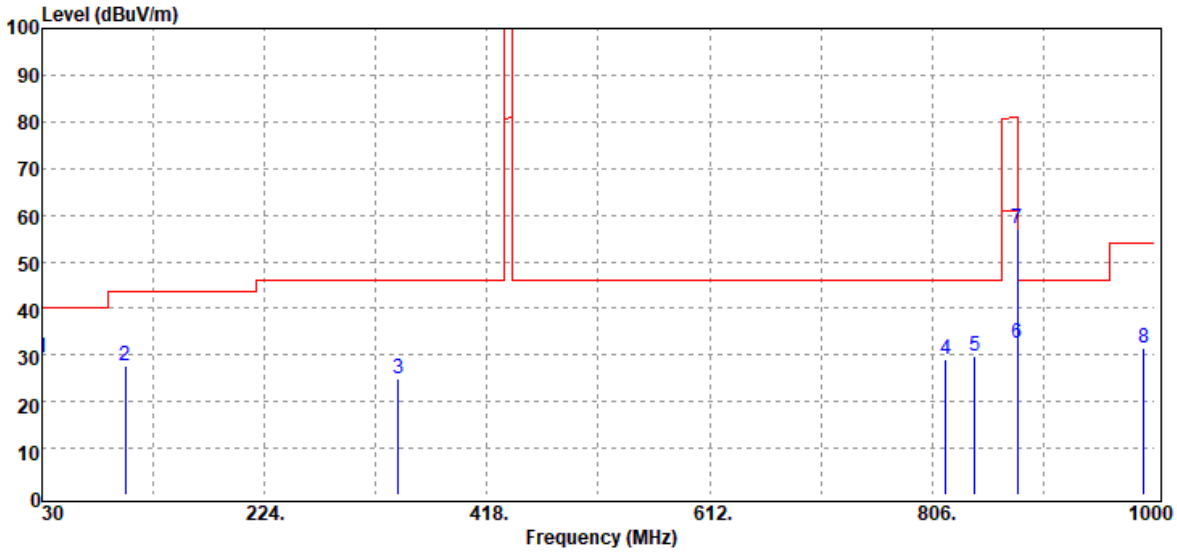
Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
30.00	Peak	30.90	-1.51	29.39	40.00	-10.61
105.66	Peak	45.87	-11.02	34.85	43.50	-8.65
217.21	Peak	35.95	-11.43	24.52	46.00	-21.48
333.61	Peak	28.65	-7.22	21.43	46.00	-24.57
817.64	Peak	26.34	2.84	29.18	46.00	-16.82
866.00	Average	-	*-24.25	31.66	60.79	-29.13
866.00	Peak	53.11	2.80	55.91	80.79	-24.88
972.84	Peak	25.70	5.56	31.26	54.00	-22.74

Test Mode:	TX-433MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Below 1GHz	Test Date	2019/09/11
Polarize	Horizontal	Test Engineer	Jerry Lu
Detector	Peak and Average		



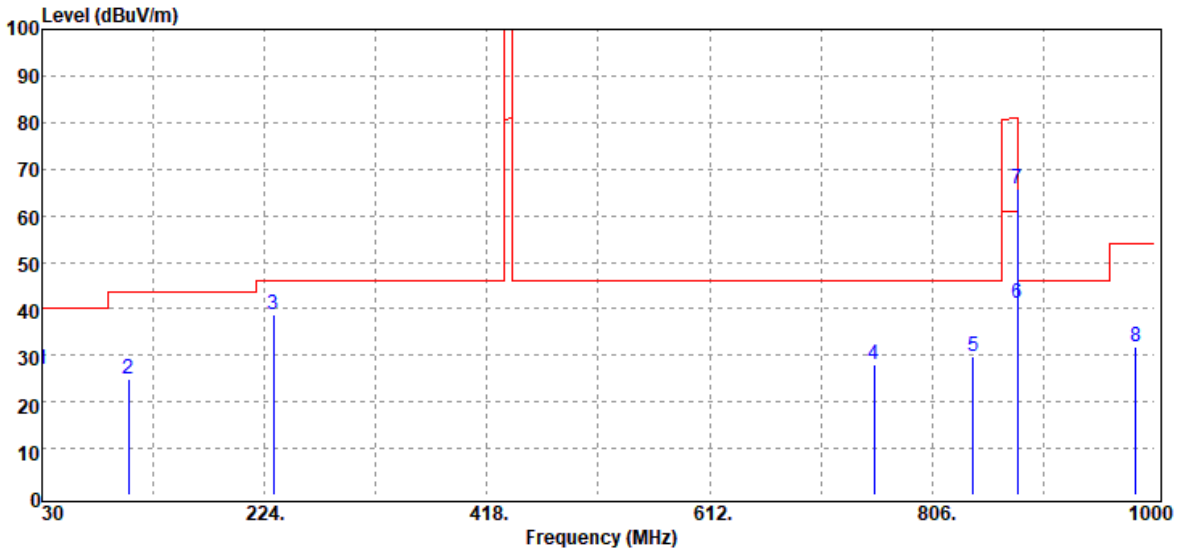
Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
30.00	Peak	28.10	-1.51	26.59	40.00	-13.41
105.66	Peak	38.78	-11.02	27.76	43.50	-15.74
256.01	Peak	32.89	-10.16	22.73	46.00	-23.27
754.59	Peak	26.40	2.00	28.40	46.00	-17.60
827.34	Peak	26.11	3.25	29.36	46.00	-16.64
866.00	Average	-	*-24.25	40.72	60.79	-20.07
866.00	Peak	62.17	2.80	64.97	80.79	-15.82
978.66	Peak	26.02	5.60	31.62	54.00	-22.38

Test Mode:	TX-440MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Below 1GHz	Test Date	2019/09/11
Polarize	Vertical	Test Engineer	Jerry Lu
Detector	Peak and Average		



Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
30.00	Peak	30.99	-1.51	29.48	40.00	-10.52
102.75	Peak	39.55	-11.87	27.68	43.50	-15.82
340.40	Peak	32.04	-7.19	24.85	46.00	-21.15
817.64	Peak	26.36	2.84	29.20	46.00	-16.80
842.86	Peak	26.37	3.35	29.72	46.00	-16.28
880.00	Average	-	*-24.25	32.80	61.02	-28.22
880.00	Peak	53.70	3.35	57.05	81.02	-23.97
990.30	Peak	26.30	5.31	31.61	54.00	-22.39

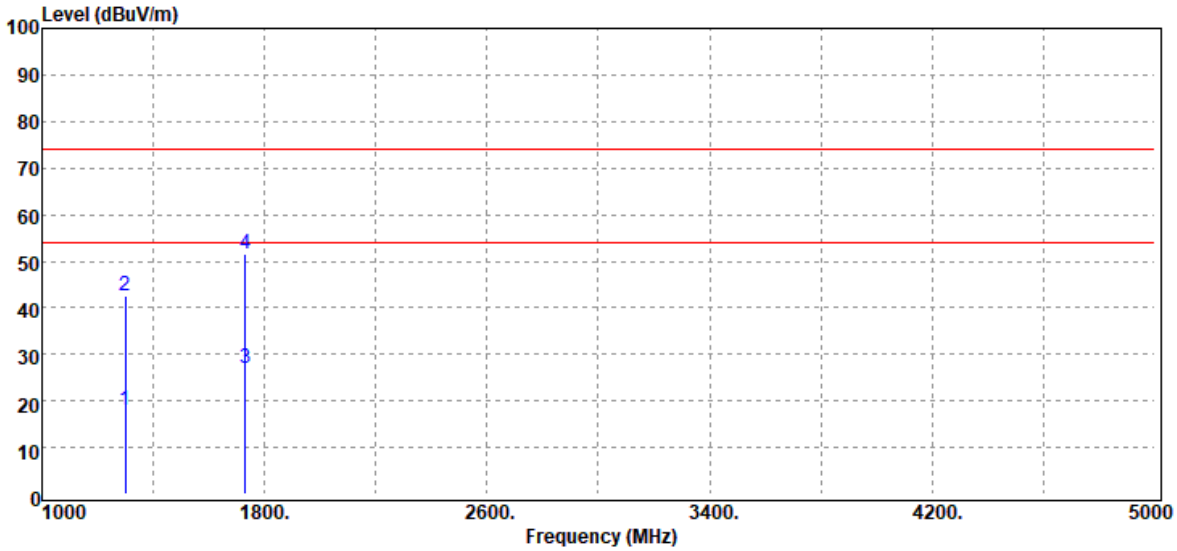
Test Mode:	TX-440MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Below 1GHz	Test Date	2019/09/11
Polarize	Horizontal	Test Engineer	Jerry Lu
Detector	Peak and Average		



Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
30.00	Peak	28.42	-1.51	26.91	40.00	-13.09
105.66	Peak	35.93	-11.02	24.91	43.50	-18.59
231.76	Peak	49.43	-10.75	38.68	46.00	-7.32
755.56	Peak	26.12	1.94	28.06	46.00	-17.94
841.89	Peak	26.14	3.50	29.64	46.00	-16.36
880.00	Average	-	*-24.25	41.48	61.02	-19.54
880.00	Peak	62.38	3.35	65.73	81.02	-15.29
983.51	Peak	26.35	5.45	31.80	54.00	-22.20

Above 1GHz

Test Mode:	TX-433MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Above 1GHz	Test Date	2019/09/11
Polarize	Vertical	Test Engineer	Jerry Lu
Detector	Peak and Average		

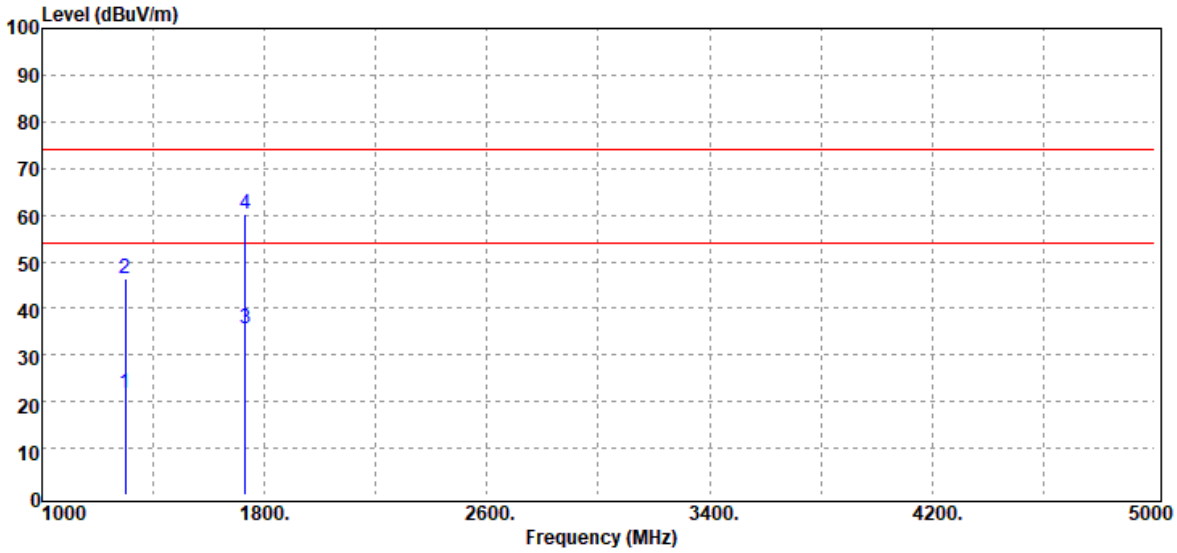


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1299.00	Average	-	*-24.25	18.27	54.00	-35.73
1299.00	Peak	50.19	-7.67	42.52	74.00	-31.48
1732.00	Average	-	*-24.25	27.18	54.00	-26.82
1732.00	Peak	57.39	-5.96	51.43	74.00	-22.57
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Test Mode:	TX-433MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Above 1GHz	Test Date	2019/09/11
Polarize	Horizontal	Test Engineer	Jerry Lu
Detector	Peak and Average		

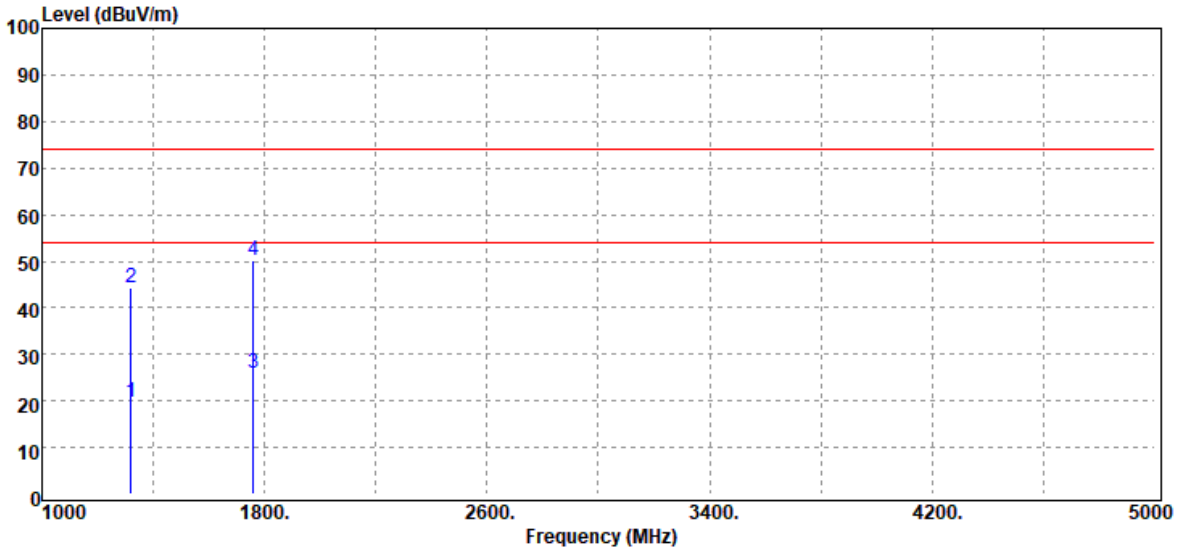


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1299.00	Average	-	*-24.25	21.96	54.00	-32.04
1299.00	Peak	53.88	-7.67	46.21	74.00	-27.79
1732.00	Average	-	*-24.25	35.98	54.00	-18.02
1732.00	Peak	66.19	-5.96	60.23	74.00	-13.77
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Test Mode:	TX-440MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Above 1GHz	Test Date	2019/09/11
Polarize	Vertical	Test Engineer	Jerry Lu
Detector	Peak and Average		

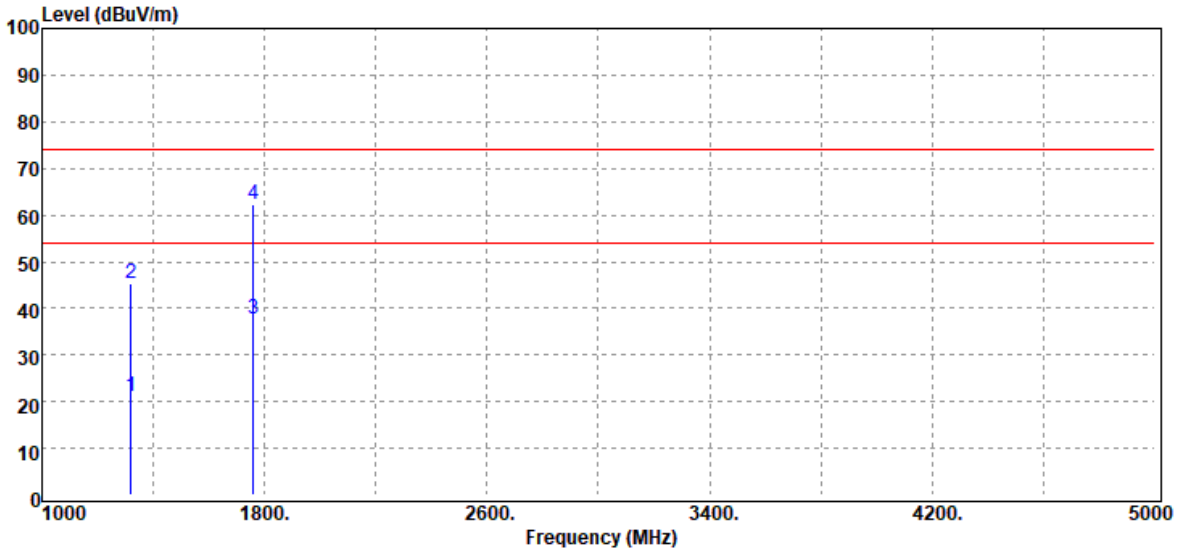


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1320.00	Average	-	*-24.25	19.88	54.00	-34.12
1320.00	Peak	51.75	-7.62	44.13	74.00	-29.87
1760.00	Average	-	*-24.25	26.04	54.00	-27.96
1760.00	Peak	56.29	-6.00	50.29	74.00	-23.71
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

Test Mode:	TX-440MHz	Temp/Hum	26.1(℃)/ 45%RH
Test Item	Above 1GHz	Test Date	2019/09/11
Polarize	Horizontal	Test Engineer	Jerry Lu
Detector	Peak and Average		



Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1320.00	Average	-	*-24.25	21.14	54.00	-32.86
1320.00	Peak	53.01	-7.62	45.39	74.00	-28.61
1760.00	Average	-	*-24.25	37.92	54.00	-16.08
1760.00	Peak	68.17	-6.00	62.17	74.00	-11.83
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*

4.5 OPERATION RESTRICTION

4.5.1 Test Limit

15.231(a)(1),

A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

RSS-210 A1.1,

Devices shall comply with the following for momentary operation:

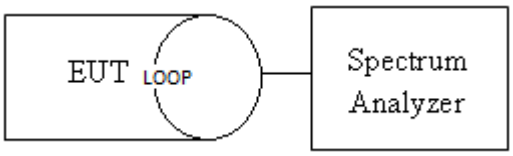
A manually operated transmitter shall be equipped with a push-to-operate switch and be under manual control at all times during transmission. When released, the transmitter shall cease transmission within no more than 5 seconds of being released.

4.5.2 Test Procedure

Test method Refer as ANSI 63.10:2013 clause 7.4

The Loop antenna connected to the spectrum analyzer, was touching to the transmitter antenna. Set the RBW=1MHz, VBW=1MHz, Detector = Peak, Trace mode = Max hold, Sweep = 1s. Measure

4.5.3 Test Setup

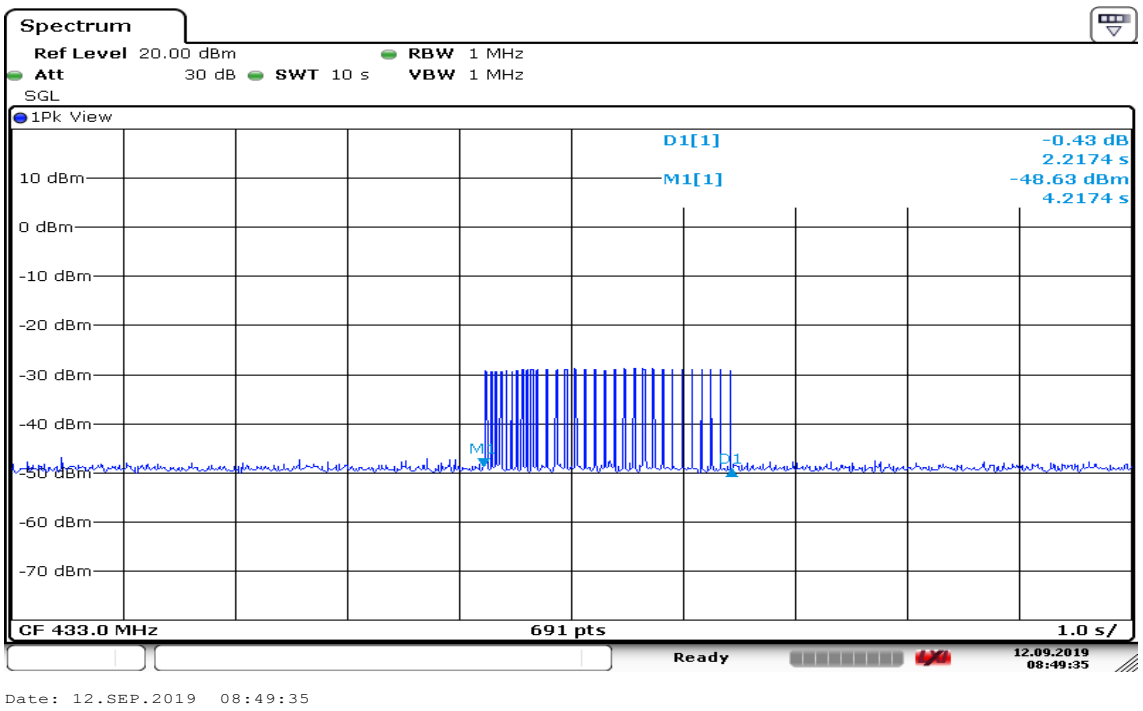


4.5.4 Test Result

Dwell Time			
Operation condition	**Pulse On Time (s)**	**Limits**	**Result**
manually operated	2.2174 sec	5 sec	PASS

Test Data

Operation Restriction



- End of Test Report -