FCC RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	**FCC Part 15.231**
Trade name	**ARC**
Product name	**Industrial radio remote control system**
Model No.	**FLEX 12EPH, FLEX 8EPH**
Operation Freq.	**433 MHz – 440MHz**
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	December 30, 2019	Initial Issue	ALL	Doris Chu
01	January 8, 2020	1. Revised section 3.2 Remark, 2.	P.11	Doris Chu

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1. GENERAL INFORMATION

1.1 EUT INFORMATION

<table>
<tr><td>Applicant</td><td>ADVANCED RADIOTECH CORPORATION
No. 3, South 1st Road, Chien Chen District, Kaohsiung City, Taiwan</td></tr>
<tr><td>Manufacturer</td><td>ADVANCED RADIOTECH CORPORATION
No. 3, South 1st Road, Chien Chen District, Kaohsiung City, Taiwan</td></tr>
<tr><td>Equipment</td><td>Industrial radio remote control system</td></tr>
<tr><td>Model Name</td><td>FLEX 12EPH, FLEX 8EPH</td></tr>
<tr><td>Model Discrepancy</td><td>
<table>
<tr><th rowspan="2">Diversity Description</th><th colspan="2">Series Model</th></tr>
<tr><th>FLEX 12EPH</th><th>FLEX 8EPH</th></tr>
<tr><td>Transmitter</td><td>O</td><td>O</td></tr>
<tr><td>Receiver</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Input power</td><td>+3.0VDC</td><td>+3.0VDC</td></tr>
<tr><td>Number of buttons</td><td>12</td><td>8</td></tr>
<tr><td>Number of solid state relays</td><td>N/A</td><td>N/A</td></tr>
<tr><td>Size</td><td>244mm (L) x 70mm (W) x 44mm (H)</td><td>198mm (L) x 70mm (W) x 44mm (H)</td></tr>
<tr><td>Others</td><td>N/A</td><td>N/A</td></tr>
</table>
</td></tr>
<tr><td>Received Date</td><td>September 2, 2019</td></tr>
<tr><td>Date of Test</td><td>November 26 ~ December 20, 2019</td></tr>
<tr><td>Periodic operation</td><td>☒ (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.</td></tr>
<tr><td>Power Operation</td><td>Power from battery: DC 3V</td></tr>
<tr><td>Operation Frequency</td><td>433MHz – 440MHz</td></tr>
<tr><td>S/W Version</td><td>V1.1.1</td></tr>
<tr><td>H/W Version</td><td>V.01.01</td></tr>
</table>

1.2 EUT CHANNEL INFORMATION

Frequency Range	433MHz – 440MHz
Modulation Type	GFSK
Bandwidth	50 kHz
Number of Channels	141 channels

Channel List

Channel		Channel		Channel	
1	433.000	51	435.500	101	438.000
2	433.050	52	435.550	102	438.050
3	433.100	53	435.600	103	438.100
4	433.150	54	435.650	104	438.150
5	433.200	55	435.700	105	438.200
6	433.250	56	435.750	106	438.250
7	433.300	57	435.800	107	438.300
8	433.350	58	435.850	108	438.350
9	433.400	59	435.900	109	438.400
10	433.450	60	435.950	110	438.450
11	433.500	61	436.000	111	438.500
12	433.550	62	436.050	112	438.550
13	433.600	63	436.100	113	438.600
14	433.650	64	436.150	114	438.650
15	433.700	65	436.200	115	438.700
16	433.750	66	436.250	116	438.750
17	433.800	67	436.300	117	438.800
18	433.850	68	436.350	118	438.850
19	433.900	69	436.400	119	438.900
20	433.950	70	436.450	120	438.950
21	434.000	71	436.500	121	439.000
22	434.050	72	436.550	122	439.050
23	434.100	73	436.600	123	439.100
24	434.150	74	436.650	124	439.150
25	434.200	75	436.700	125	439.200
26	434.250	76	436.750	126	439.250
27	434.300	77	436.800	127	439.300
28	434.350	78	436.850	128	439.350
29	434.400	79	436.900	129	439.400
30	434.450	80	436.950	130	439.450
31	434.500	81	437.000	131	439.500
32	434.550	82	437.050	132	439.550
33	434.600	83	437.100	133	439.600
34	434.650	84	437.150	134	439.650
35	434.700	85	437.200	135	439.700
36	434.750	86	437.250	136	439.750
37	434.800	87	437.300	137	439.800
38	434.850	88	437.350	138	439.850
39	434.900	89	437.400	139	439.900
40	434.950	90	437.450	140	439.950
41	435.000	91	437.500	141	440.000
42	435.050	92	437.550		
43	435.100	93	437.600		
44	435.150	94	437.650		
45	435.200	95	437.700		
46	435.250	96	437.750		
47	435.300	97	437.800		
48	435.350	98	437.850		
49	435.400	99	437.900		
50	435.450	100	437.950		

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

1.3 ANTENNA INFORMATION

Antenna Type	☐ PIFA ☒ PCB ☐ Dipole
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 Chang	-
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**
Signal Analyzer	R&S	FSV 40	101073	09/25/2019	09/24/2020
Software	N/A				

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
Coaxial Cable	HUBER SUHNER	SUCOFLEX 104PEA	20995	02/26/2019	02/25/2020
Coaxial Cable	EMCI	EMC105	190914+25111	09/20/2019	09/19/2020
Digital Thermo-Hygro Meter	WISEWIND	1206	D07	01/30/2019	01/29/2020
double Ridged Guide Horn Antenna	ETC	MCTD 1209	DRH13M02003	10/04/2019	10/03/2020
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	05/29/2019	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.

2. TEST SUMMERY

Standard Sec.	Chapter	Test Item	Result
15.203	1.3	Antenna Requirement	Pass
15.207	4.1	AC Power-line Conducted Emission	Not applicable
15.231(c)	4.2	Emission Bandwidth	Pass
15.231(b)	4.3	Fundamental Emission	Pass
15.209(b)	4.4	Transmitter Radiated Emission	Pass
15.231(a)(1)	4.5	Operation Restriction	Pass

3. DESCRIPTION OF TEST MODES

3.1 THE WORST MODE OF OPERATING CONDITION

Operation mode	433 MHz	440 MHz
RF Filed strength	Peak: 98.62 dBuv/m Average : 78.75 dBuv/m	Peak: 96.43 dBuv/m Average : 76.56 dBuv/m

Remark: Field strength performed Average level at 3m.

3.2 THE WORST MODE OF MEASUREMENT

Radiated Emission Measurement Above 1G	
Test Condition	**Radiated Emission Above 1G**
Power supply Mode	**Mode 1: 12 buttons TX Power by Battery & RX Power by DC Power Supply** **Mode 2: 8 buttons TX Power by Battery & RX Power by DC Power Supply**
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)**

Radiated Emission Measurement Below 1G	
Test Condition	**Radiated Emission Below 1G**
Power supply Mode	**Mode 1: 12 buttons TX Power by Battery & RX Power by DC Power Supply** **Mode 2: 8 buttons TX Power by Battery & RX Power by DC Power Supply**
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(Y-Plane and Horizontal) were recorded in this report
3. The worst case in conducted is FLEX 8EPH, the worst case in Radiated Emission is FLEX 12EPH.

3.3 FCC PART 15.231 PERIODIC OPERATION IN THE BAND 40.66-40.70 MHZ AND ABOVE 70 MHZ

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:

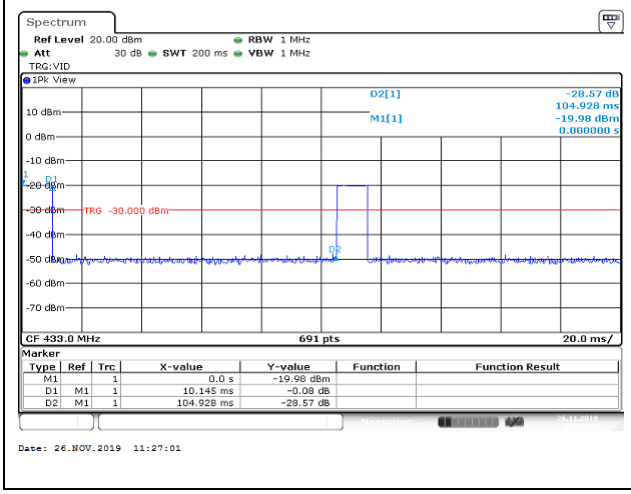
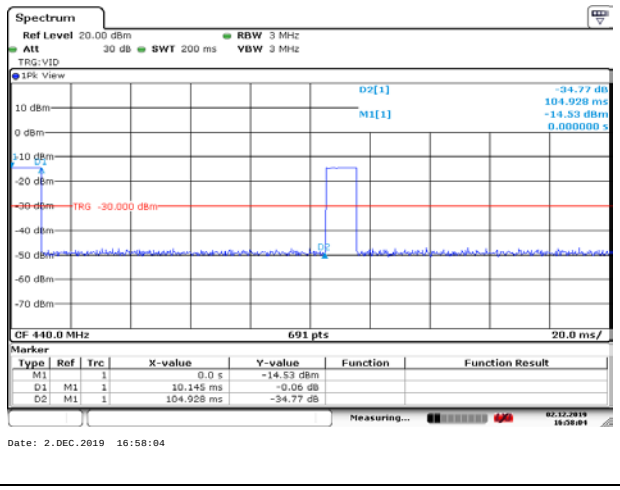
Fundamental frequency (MHz)	Field strength of fundamental (microvolts/meter)	Field strength of spurious emissions (microvolts/meter)
40.66-40.70	1,000	100
70-130	500	50
130-174	500 to 1,500[1]	50 to 150[1]
174-260	1,500	150
260-470	1,500 to 5,000[1]	150 to 500[1]
Above 470	5,000	500

[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

Duty Cycle				
Configuration	TX ON (ms)	TX All(ms)	Duty Cycle (%)	Duty Factor(dB)
433 MHz	10.15	100.00	10.15%	-19.87
440 MHz	10.15	100.00	10.15%	-19.87

433 MHz	440 MHz
	

4. TEST RESULT

4.1 AC POWER LINE CONDUCTED EMISSION

4.1.1 Test Limit

According to §15.207(a),

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

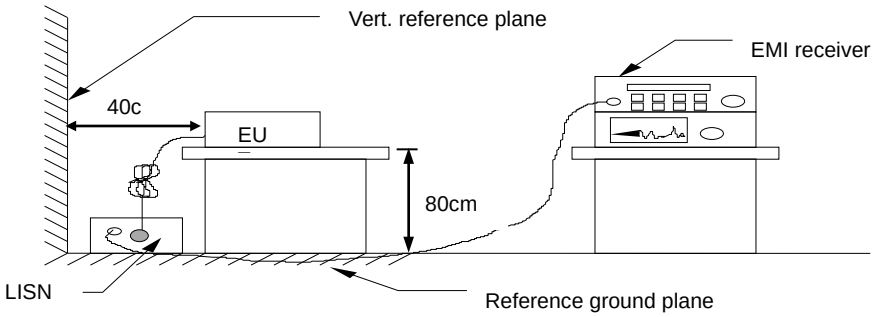
* Decreases with the logarithm of the frequency.

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),

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

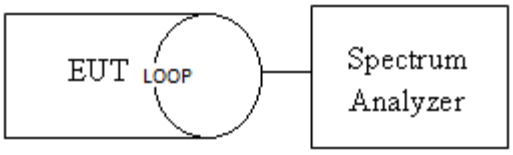
4.2.2 Test Procedure

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 (MHz)		99% Occupied BW (MHz)		Limits (MHz)		Result
	FL	FH	FL	FH	FL	FH	
433	432.9711	433.029	432.94645	433.06368	431.9175	434.0825	Pass
440	439.9609	440.0275	439.94356	440.07091	438.9	441.1	Pass

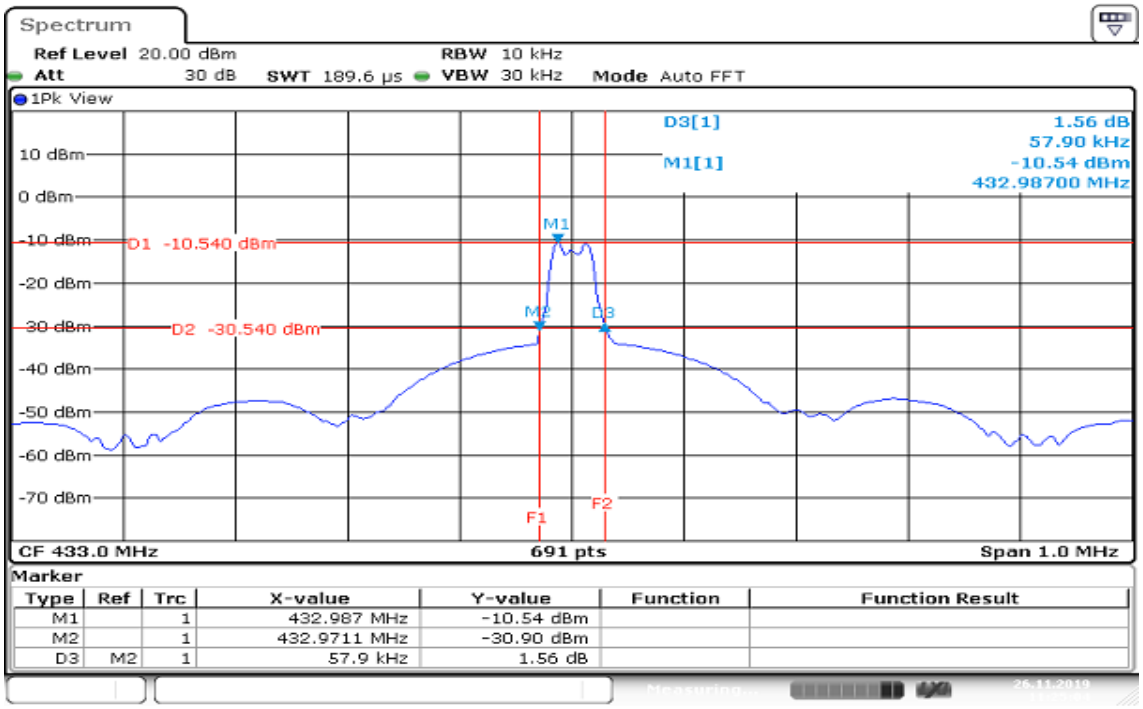
433MHz Limits：
FL：433MHz - (433MHz * 0.25 %) = 431.9175MHz
FL：433MHz + (433MHz * 0.25 %) = 434.0825MHz

440MHz Limits：
FL：440MHz - (440MHz * 0.25 %) = 438.9MHz
FL：440MHz + (440MHz * 0.25 %) = 441.1MHz

Test Data

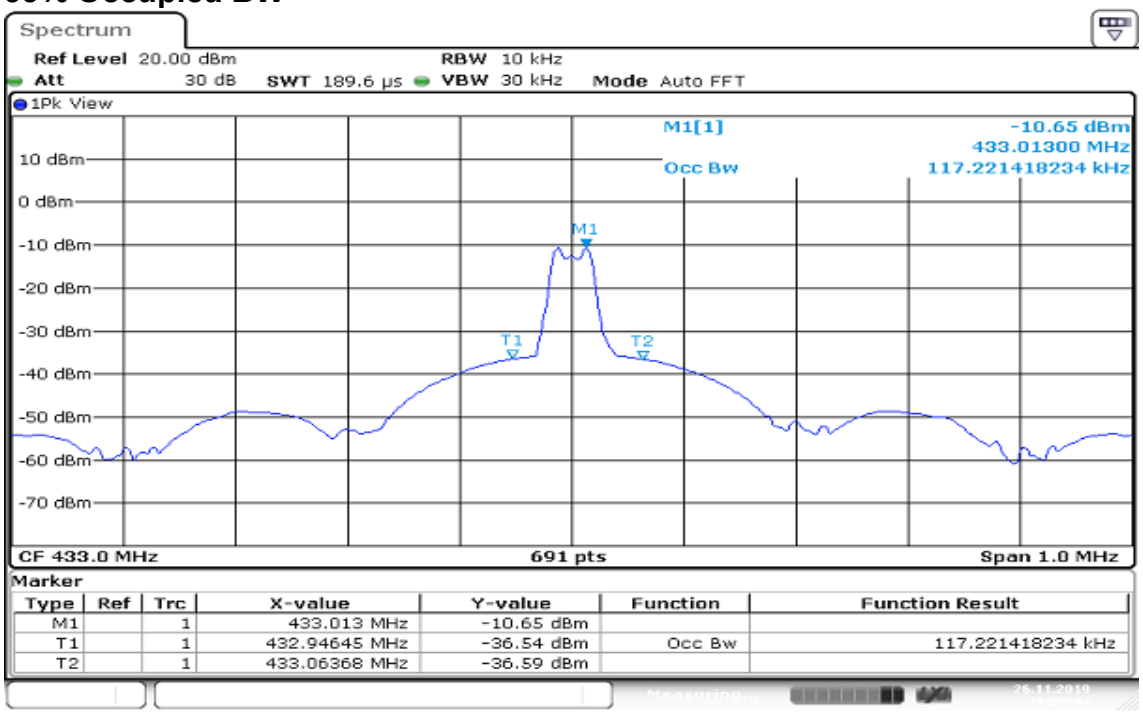
433 MHz

20dB Bandwidth



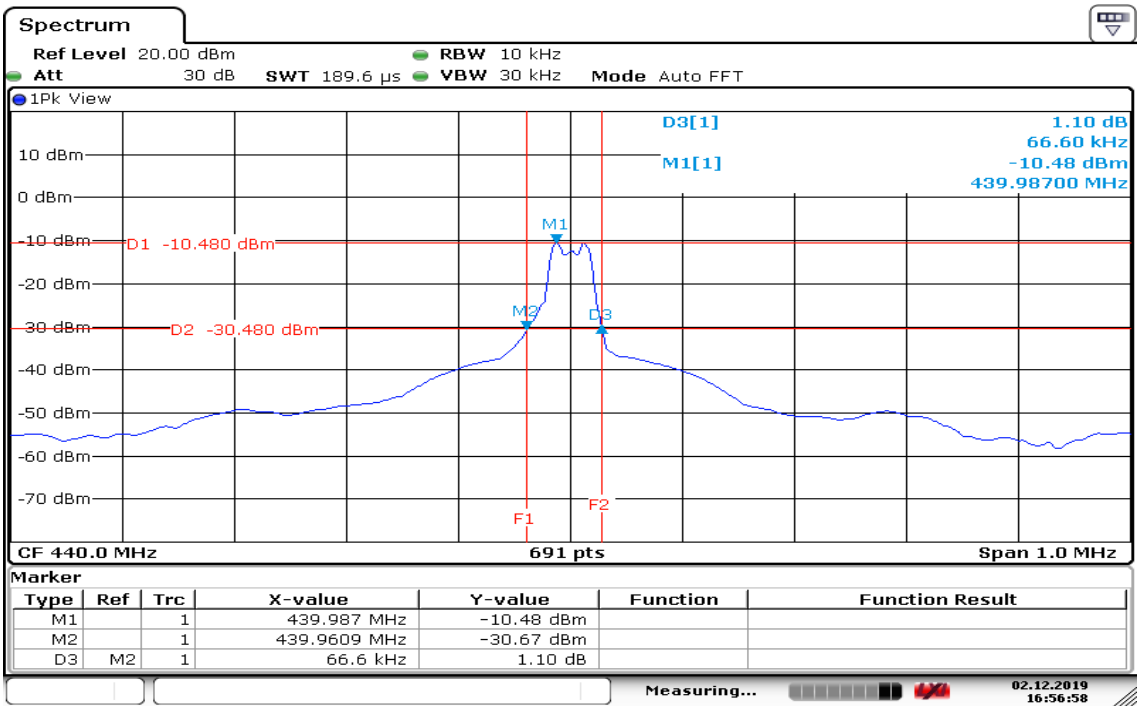
Date: 26.NOV.2019 11:25:04

99% Occupied BW



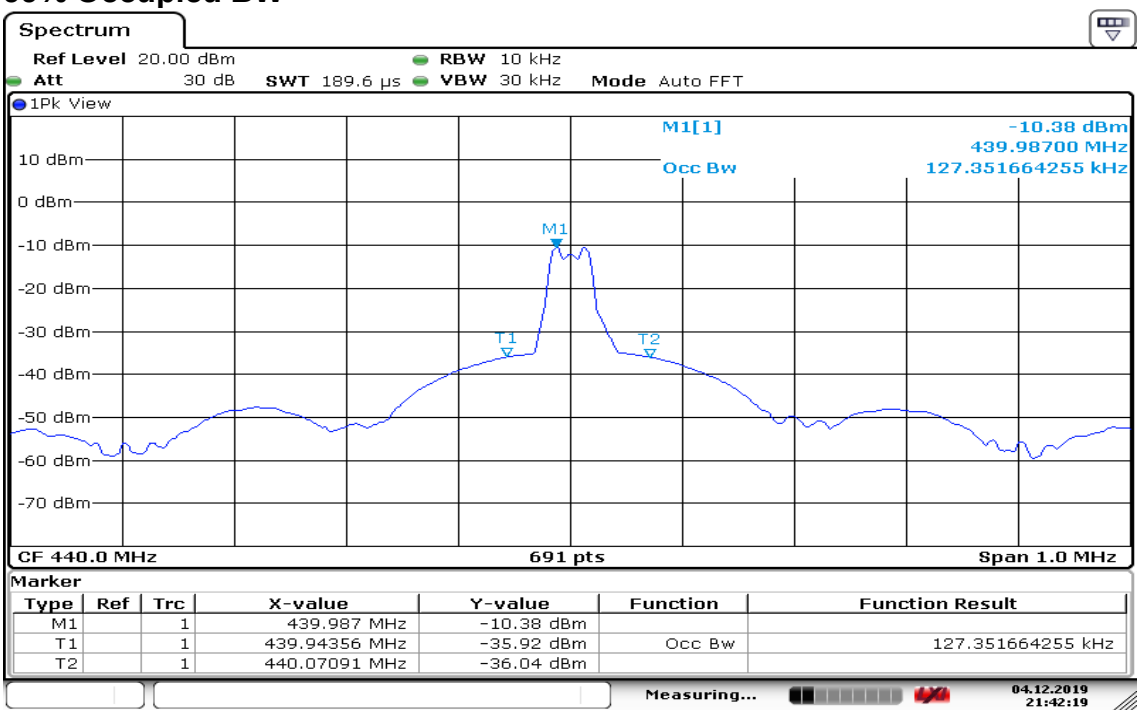
Date: 26.NOV.2019 11:22:44

440 MHz
20dB Bandwidth



Date: 2.DEC.2019 16:56:58

99% Occupied BW



Date: 4.DEC.2019 21:42:19

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

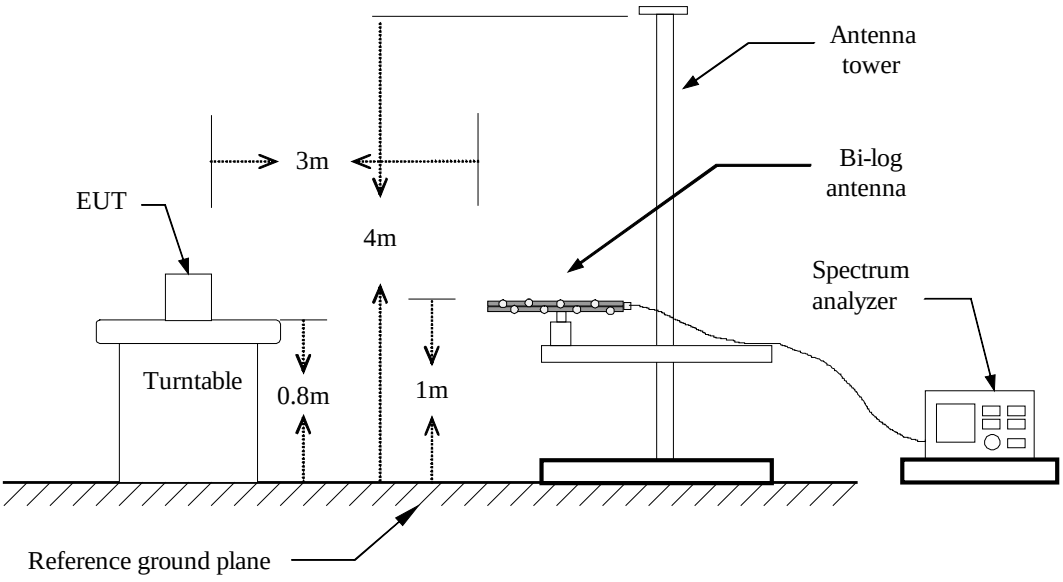
* Linear interpolation with frequency, f, in MHz:
For 130-174 MHz: Field Strength (μV/m) = (56.82 × f)−6136
For 260-470 MHz: Field Strength (μV/m) = (41.67 × f)−7083

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	78.75	80.80	-2.05	X/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 = 98.62 dBuV/m –19.87= 78.75dBuV/m

*3. 260MHz ~ 470MHz limit is 41.67 * (Frequency, MHz) – 7083*

*Limit = 41.67 * (433 MHz) – 7083*

= 10960.11 (uV/m)

dBuv/m = 20 Log (uV/m) = 20 Log (10960.11 uV/m)= 80.80dBuV/m

Field Strength					
Frequency (MHz)	**Fundamental (dBuV/m) at 3m**	**Limit (dBuV/m) at 3m**	**Margin (dB)**	**Axis/Pol.**	**Remark**
440	76.56	81.02	-4.46	X/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 = 96.43 dBuV/m –19.87= 76.56dBuV/m

*3. 260MHz ~ 470MHz limit is 41.67 * (Frequency, MHz) – 7083*

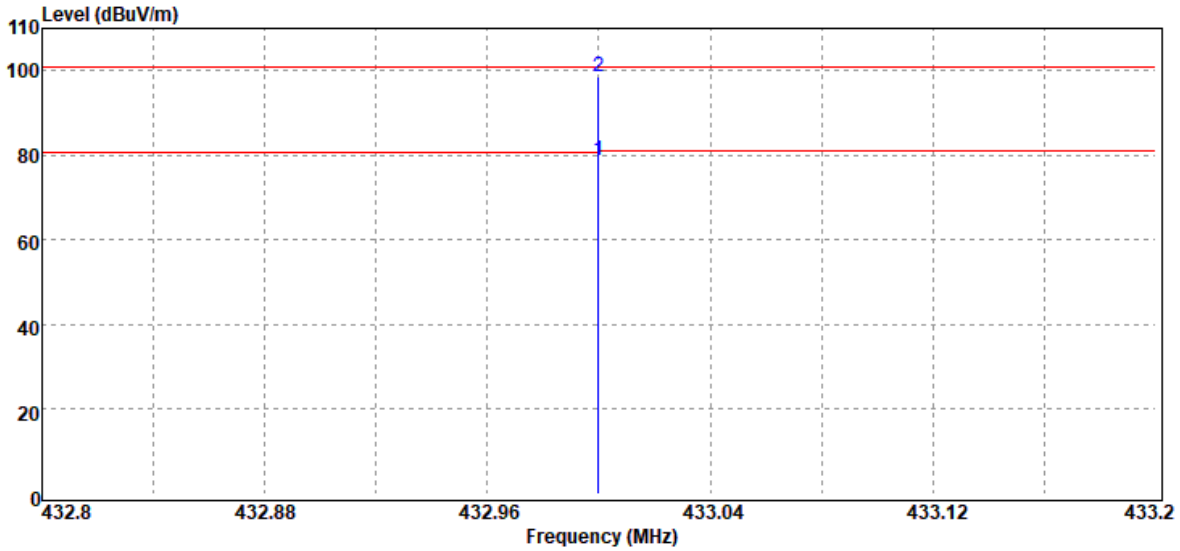
*Limit = 41.67 * (440 MHz) – 7083*

=11251.8 (uV/m)

dBuv/m = 20 Log(uV/m) = 20 Log (11251.8 uV/m)= 81.02dBuV/m

Test Data

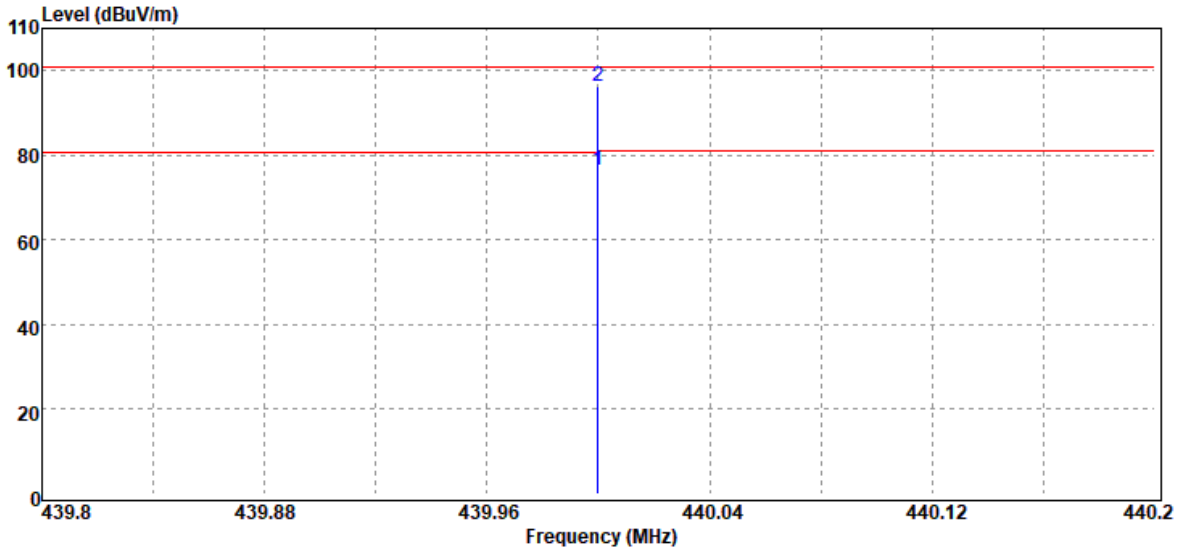
Test Mode:	TX-433MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Fundamental	Test Date	December 20, 2019
Axis/Polarize	X-Plane /Hor..	Test Engineer	Jerry Chang
Detector	Peak & AVG		



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	102.91	-4.29	98.62	100.79	-2.17

Note:
No.1 Average result = Peak result + Duty factor = 98.62 dBuV/m –19.87= 78.75dBuV/m

Test Mode:	TX-440MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Fundamental	Test Date	November 27, 2019
Axis/Polarize	X-Plane /Hor..	Test Engineer	Jerry Chang
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	100.48	-4.05	96.43	101.02	-4.59

Note:
No.1 Average result = Peak result + Duty factor = 96.43 dBuV/m –19.87= 76.56dBuV/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 §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

.

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:

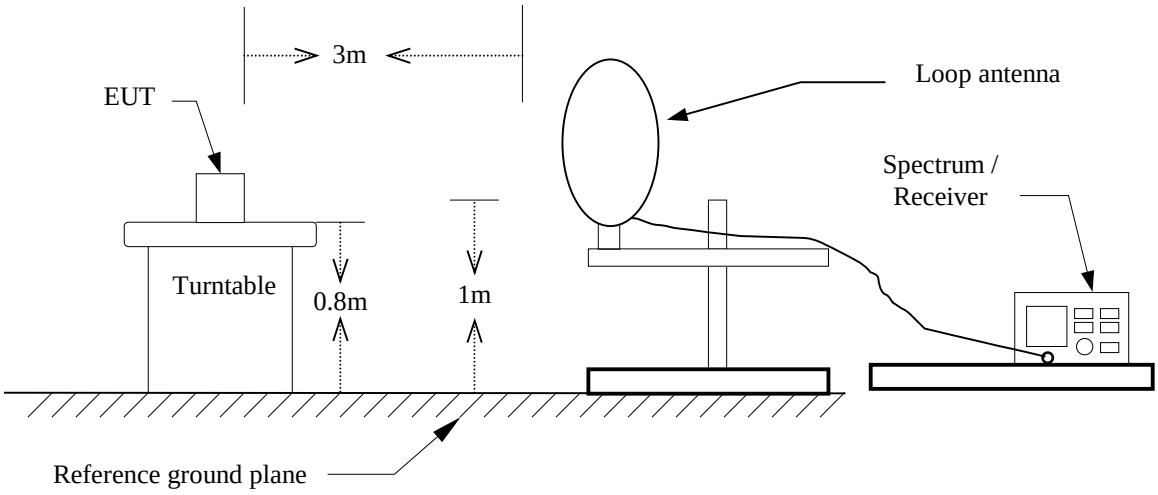
   (a)PEAK: RBW=1MHz / VBW=3MHz / Sweep=AUTO

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

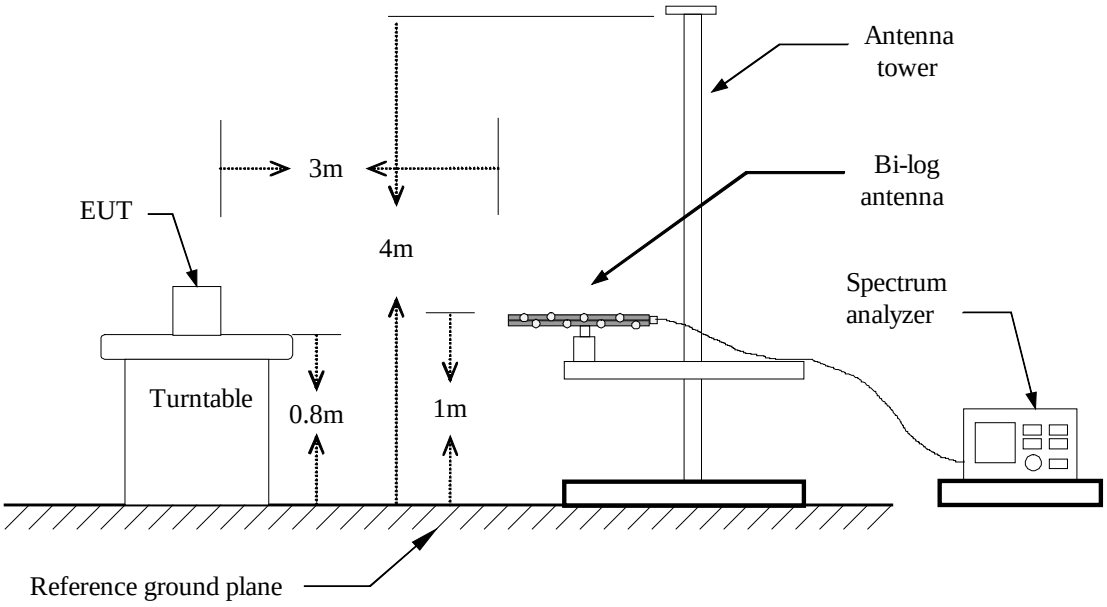
Remark.
1. Although these tests were performed other than open area test site, adequate comparison measurements were confirmed against 30 m open are test site. Therefore sufficient tests were made to demonstrate that the alternative site produces results that correlate with the ones of tests made in an open field based on KDB 414788.
2. No emission found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz).

4.4.3 Test Setup

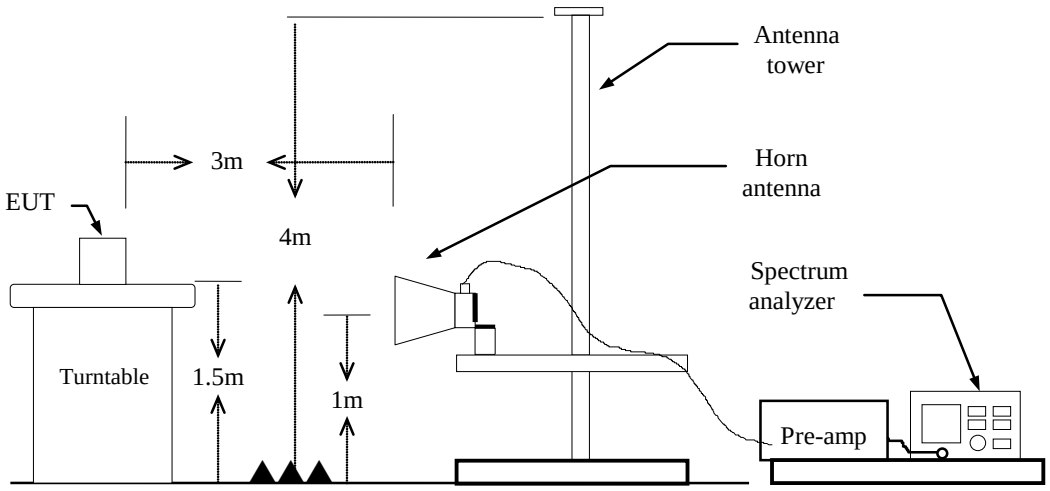
9kHz ~ 30MHz



30MHz ~ 1 GHz



Above 1 GHz



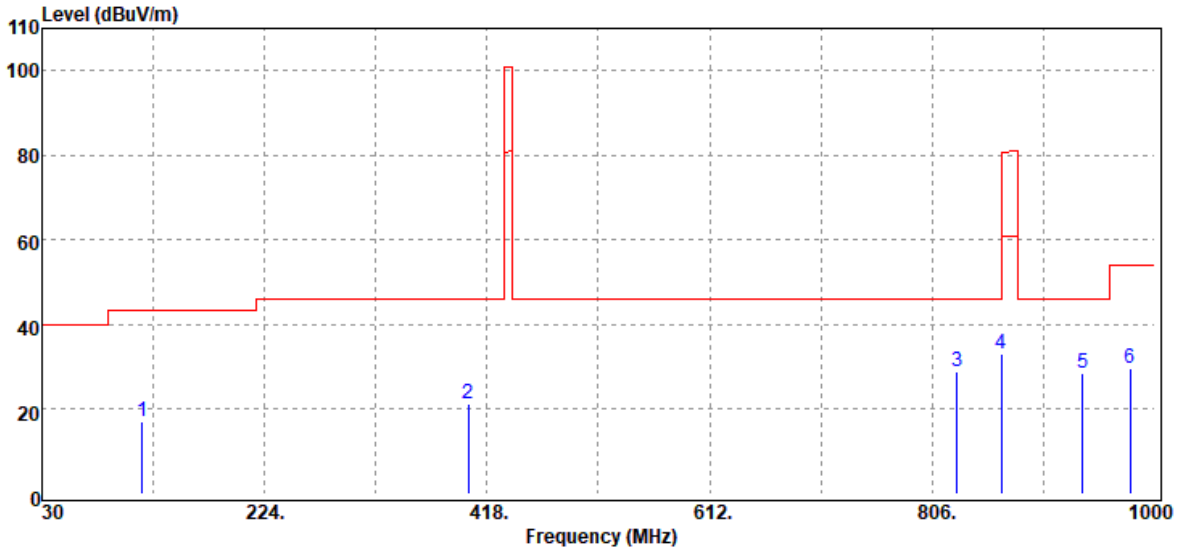
4.4.4 Test Result

Pass.

Test Data

Below 1GHz

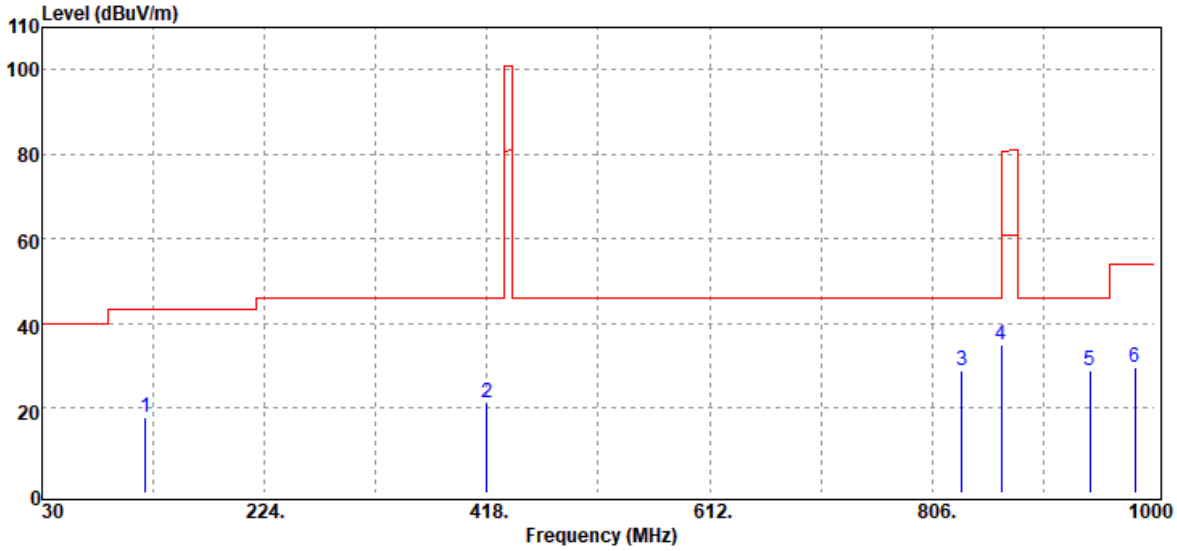
Test Mode:	TX-433MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Below 1GHz	Test Date	November 27, 2019
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
117.30	Peak	25.98	-9.02	16.96	43.50	-26.54
401.51	Peak	26.76	-5.63	21.13	46.00	-24.87
827.34	Peak	25.59	3.25	28.84	46.00	-17.16
866.14	Peak	30.30	2.80	33.10	80.79	-47.69
936.95	Peak	24.70	3.84	28.54	46.00	-17.46
978.66	Peak	23.99	5.60	29.59	54.00	-24.41

Remark: *1. For frequency 866.10MHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

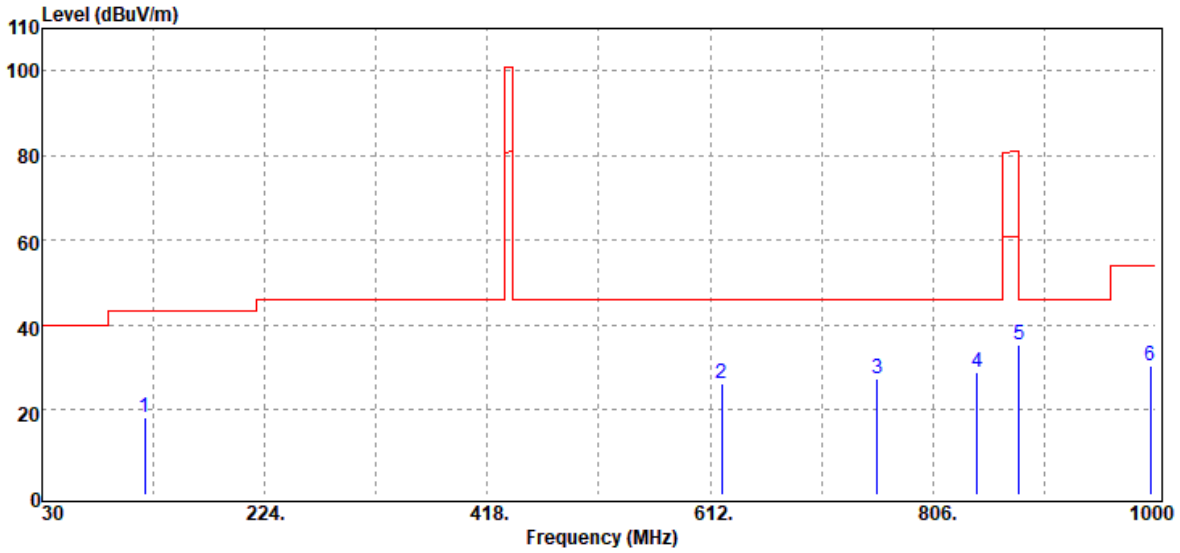
Test Mode:	TX-433MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Below 1GHz	Test Date	November 27, 2019
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
120.21	Peak	26.73	-8.88	17.85	43.50	-25.65
418.00	Peak	26.10	-4.68	21.42	46.00	-24.58
832.19	Peak	25.54	3.45	28.99	46.00	-17.01
866.14	Peak	32.23	2.80	35.03	80.79	-45.76
943.74	Peak	24.98	4.02	29.00	46.00	-17.00
982.54	Peak	24.15	5.57	29.72	54.00	-24.28

Remark: *1. For frequency 866.10MHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

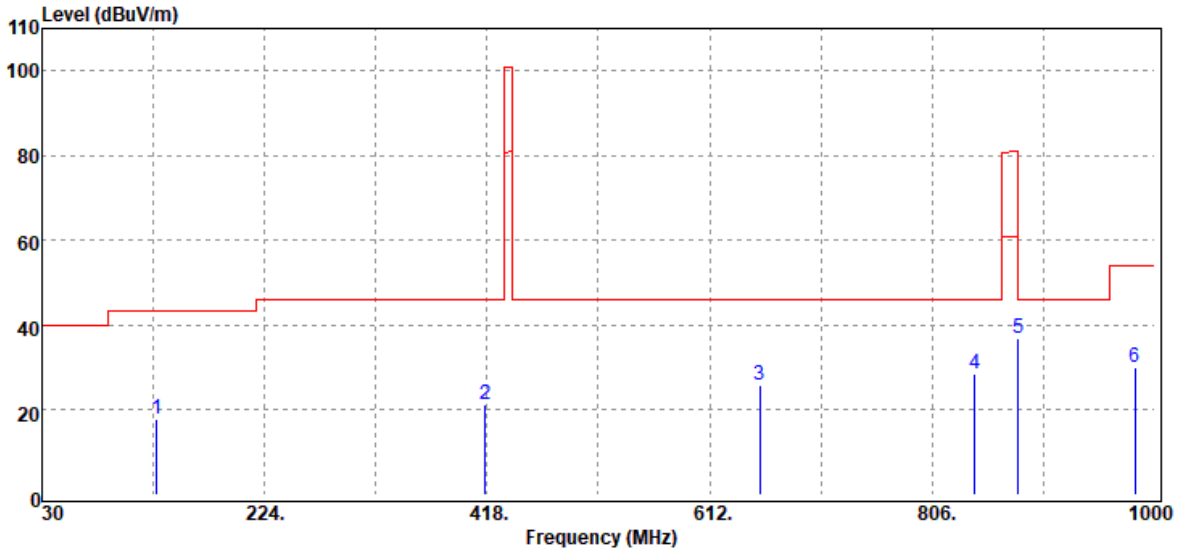
Test Mode:	TX-440MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Below 1GHz	Test Date	November 27, 2019
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		



Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
119.24	Peak	27.08	-8.94	18.14	43.50	-25.36
621.70	Peak	26.92	-0.81	26.11	46.00	-19.89
757.50	Peak	25.40	2.04	27.44	46.00	-18.56
844.80	Peak	25.65	3.12	28.77	46.00	-17.23
880.69	Peak	31.94	3.39	35.33	46.00	-10.67
995.15	Peak	25.41	5.17	30.58	54.00	-23.42

Remark: *1. For frequency 869.15MHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	TX-440MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Below 1GHz	Test Date	November 27, 2019
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		

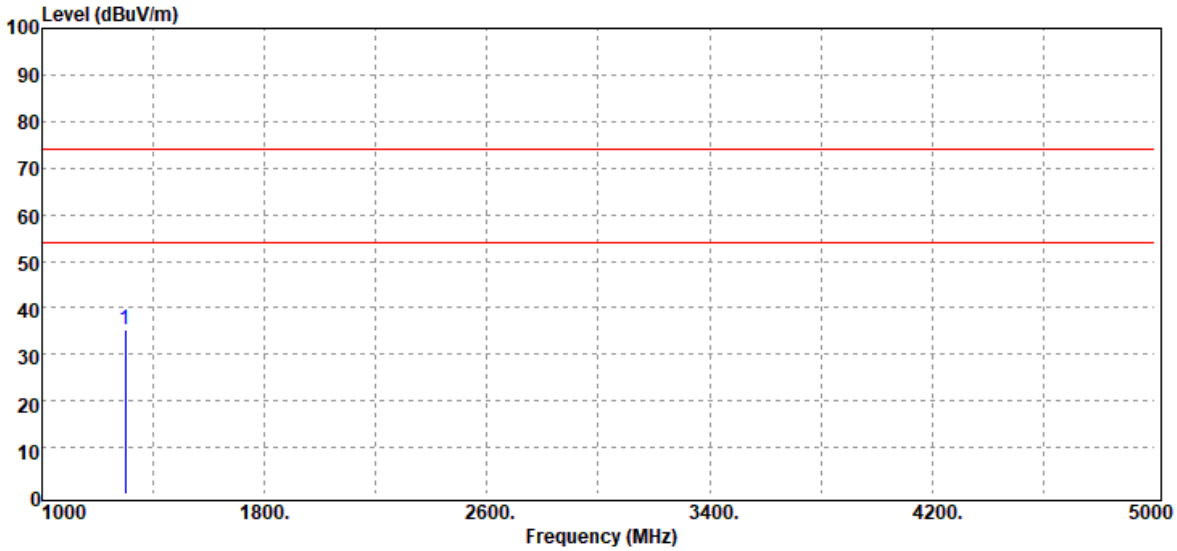


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
129.91	Peak	26.93	-8.93	18.00	43.50	-25.50
416.06	Peak	26.31	-4.89	21.42	46.00	-24.58
655.65	Peak	25.73	0.00	25.73	46.00	-20.27
842.86	Peak	25.04	3.35	28.39	46.00	-17.61
880.69	Peak	33.63	3.39	37.02	46.00	-8.98
982.54	Peak	24.39	5.57	29.96	54.00	-24.04

Remark: *1. For frequency 869.15MHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Above 1GHz

Test Mode:	TX-433MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Above 1GHz	Test Date	November 27, 2019
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		

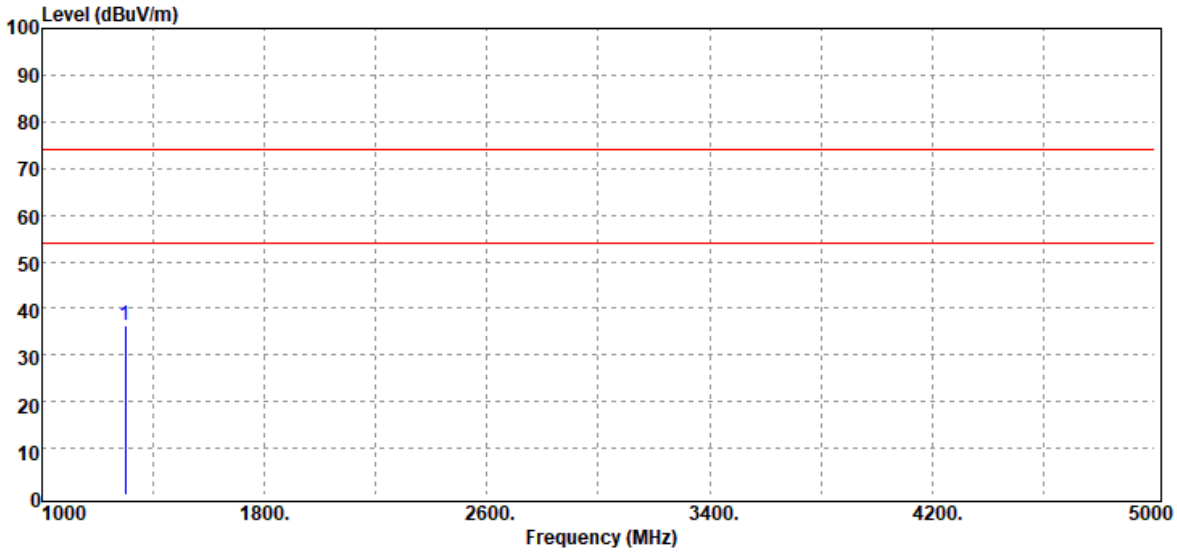


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1299.00	Peak	42.90	-7.67	35.23	74.00	-38.77
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	TX-433MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Above 1GHz	Test Date	November 27, 2019
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		

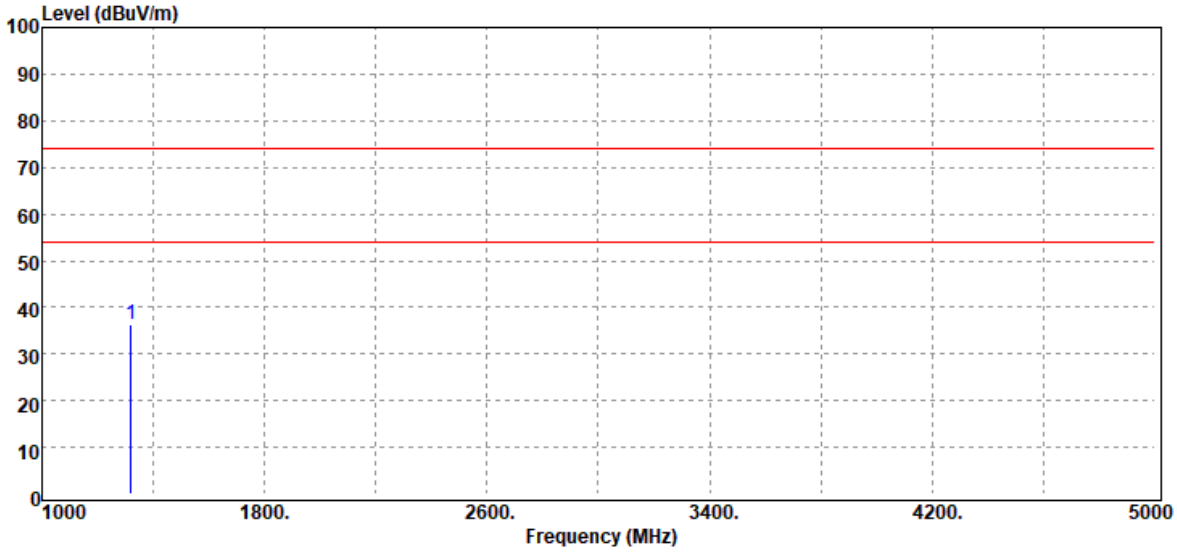


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1299.00	Peak	43.87	-7.67	36.20	74.00	-37.80
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	TX-440MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Above 1GHz	Test Date	November 27, 2019
Polarize	Vertical	Test Engineer	Jerry Chang
Detector	Peak		

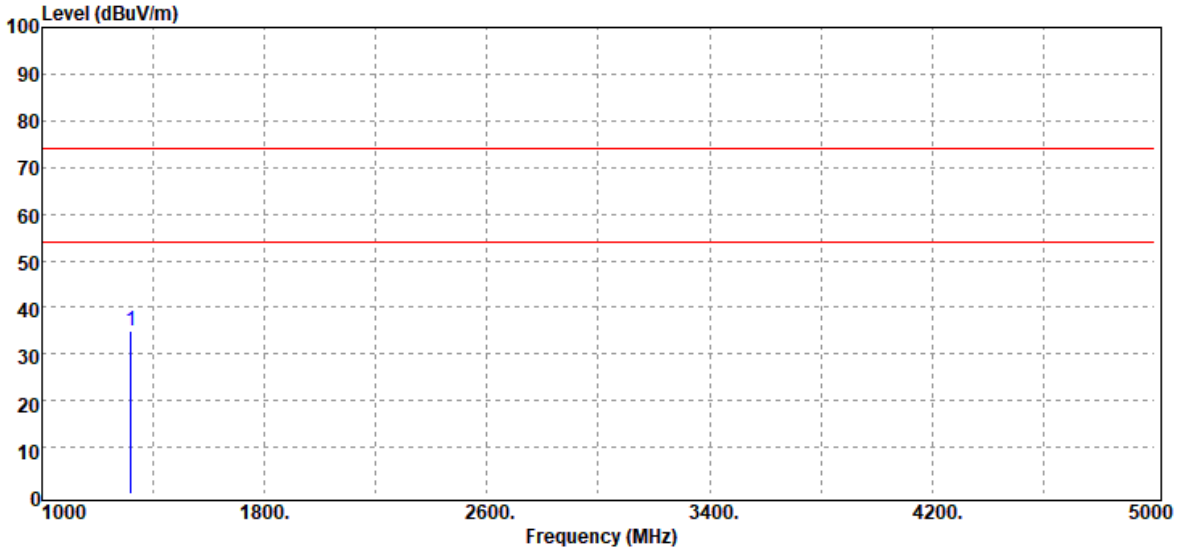


Frequency (MHz)	Detector Mode PK/QP/AV	Spectrum Reading Level (dBuV)	Factor (dB)	Actual FS (dBuV/m)	Limit @3m (dBuV/m)	Margin (dB)
1320.00	Peak	44.10	-7.62	36.48	74.00	-37.52
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

Test Mode:	TX-440MHz	Temp/Hum	22.5(℃)/ 59%RH
Test Item	Above 1GHz	Test Date	November 27, 2019
Polarize	Horizontal	Test Engineer	Jerry Chang
Detector	Peak		



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	Peak	42.71	-7.62	35.09	74.00	-38.91
N/A						

Remark:

1. *Measuring frequencies from 1 GHz to the 10th harmonic of highest fundamental frequency.*
2. *For above 1GHz,the EUT peak value was under average limit, therefore the Average value compliance with the average limit*

4.5 OPERATION RESTRICTION

4.5.1 Test Limit

15.231(a)(1),

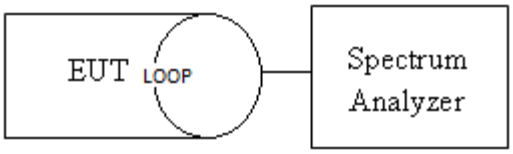
A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

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

433MHz

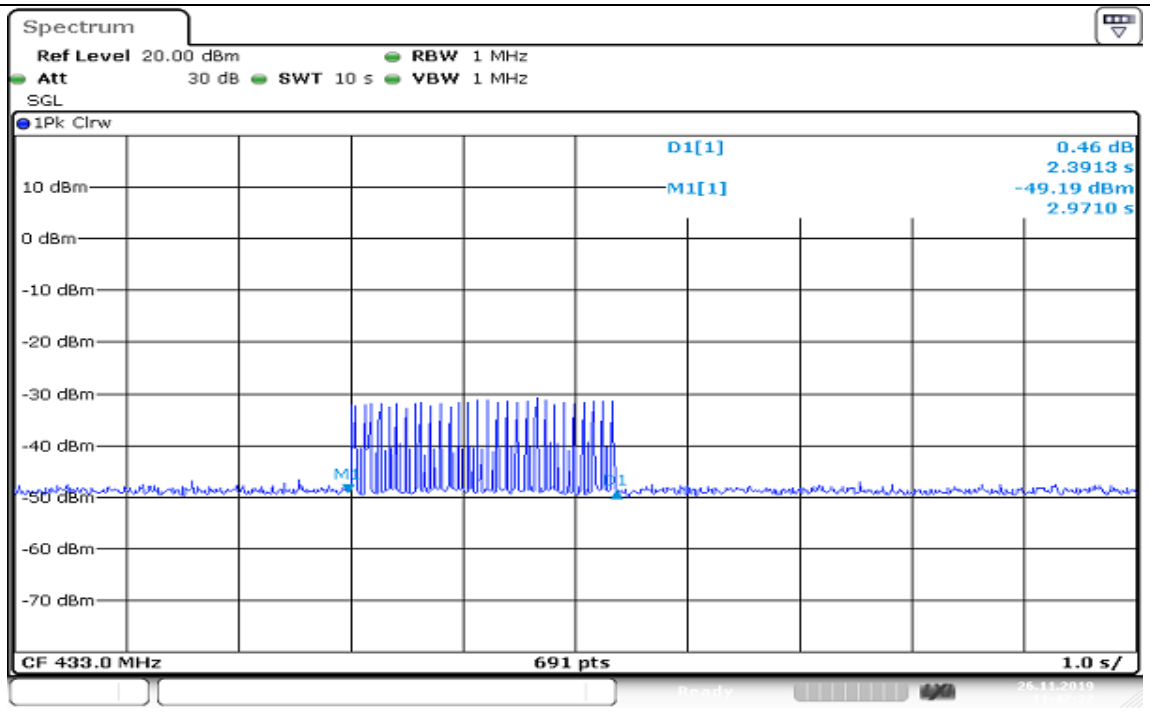
Dwell Time			
Operation condition	**Pulse On Time (s)**	**Limits**	**Result**
manually operated	2.3913	5 sec	PASS

440MHz

Dwell Time			
Operation condition	**Pulse On Time (s)**	**Limits**	**Result**
manually operated	2.1594	5 sec	PASS

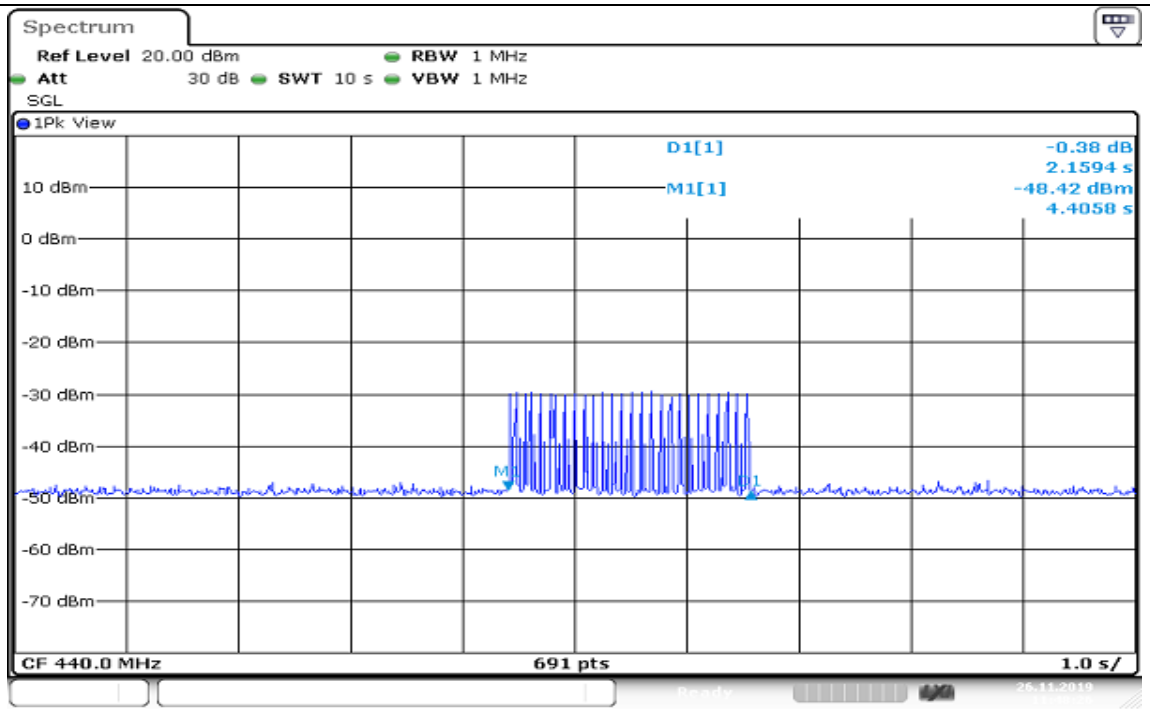
Test Data

433MHz



Date: 26.NOV.2019 11:47:22

440MHz



Date: 2.DEC.2019 17:08:46

- End of Test Report -