

FCC RADIO TEST REPORT

FCC 47 CFR PART 15 SUBPART C

Test Standard	FCC Part 15.231
FCC ID	KR5IK4CH-01
Trade name	Continental
Product name	Radio Frequency Transmitter(Key Fob)
Model No.	IK4CH-01
Operation Freq.	433.92 MHz
Test Result	Pass

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)

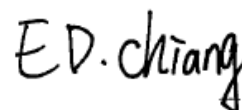


Approved by:



Sam Chuang
Manager

Reviewed by:



ED Chiang
Engineer

Revision History

Rev.	Issue Date	Revisions	Revised By
00	May 2, 2017	Initial Issue	Angel Cheng
01	July 6, 2017	<ol style="list-style-type: none"> 1. Modify bandwidth in P.5. 2. Added section 3.3 in P.11. 3. Modify section 4.3.4 in P.16. 	Angel Cheng
02	July 11, 2017	<ol style="list-style-type: none"> 1. Modify section 3.3 in P.11 2. Modify section 4.3.4 in P.16 	Angel Cheng
03	July 13, 2017	<ol style="list-style-type: none"> 1. Modify RF filed strength in P.10. 2. Modify section 3.3 in P.11 3. Modify notes in P.16 	Angel Cheng
04	July 14, 2017	<ol style="list-style-type: none"> 1. Modify above 1GHz Data in page 24-25. 	Angel Cheng

Table of contents

- 1. GENERAL INFORMATION 4**
 - 1.1 EUT INFORMATION 4**
 - 1.2 EUT CHANNEL INFORMATION 5**
 - 1.3 ANTENNA INFORMATION 5**
 - 1.4 MEASUREMENT UNCERTAINTY..... 6**
 - 1.5 FACILITIES AND TEST LOCATION 7**
 - 1.6 INSTRUMENT CALIBRATION 7**
 - 1.7 SUPPORT AND EUT ACCESSORIES EQUIPMENT 8**
 - 1.8 TEST METHODOLOGY AND APPLIED STANDARDS 8**
 - 1.9 TABLE OF ACCREDITATIONS AND LISTINGS 8**
- 2. TEST SUMMERY 9**
- 3. DESCRIPTION OF TEST MODES 10**
 - 3.1 THE WORST MODE OF OPERATING CONDITION 10**
 - 3.2 THE WORST MODE OF MEASUREMENT 10**
- 4. TEST RESULT 12**
 - 4.1 AC POWER LINE CONDUCTED EMISSION 12**
 - 4.2 EMISSION BANDWIDTH 13**
 - 4.3 FIELD STRENGTH OF FUNDAMENTAL 15**
 - 4.4 RADIATION UNWANTED EMISSION 18**
 - 4.5 OPERATION RESTRICTION..... 26**

APPENDIX 1 – PHOTOGRAPHS OF EUT

1. GENERAL INFORMATION

1.1 EUT INFORMATION

Applicant	Continental Automotive GmbH Siemensstrasse 12, 93055, Regensburg, Germany
Equipment	Radio Frequency Transmitter(Key Fob)
Model Name	IK4CH-01
Model Discrepancy	N/A
Received Date	April 18, 2017
Date of Test	May 2 ~ July 14, 2017
Periodic operation	<input checked="" type="checkbox"/> (1) A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released. <input type="checkbox"/> (2) A transmitter activated automatically shall cease transmission within 5 seconds after activation <input type="checkbox"/> (3) Periodic transmissions at regular predetermined intervals are not permitted. <input type="checkbox"/> (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	Lithium battery: 3V

1.2 EUT CHANNEL INFORMATION

Frequency Range	433.92 MHz
Modulation Type	FSK
Bandwidth	227.206 KHz
Number of Channels	1 channel

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
<input checked="" type="checkbox"/> 1 MHz or less	1	Middle
<input type="checkbox"/> 1 MHz to 10 MHz	2	1 near top and 1 near bottom
<input type="checkbox"/> More than 10 MHz	3	1 near top, 1 near middle, and 1 near bottom

1.3 ANTENNA INFORMATION

Antenna Type	PCB Antenna
Antenna Gain	-17dBi

1.4 MEASUREMENT UNCERTAINTY

PARAMETER	UNCERTAINTY
AC Powerline Conducted Emission	+/- 1.2575
Emission bandwidth, 20dB bandwidth	+/- 1.4003
RF output power, conducted	+/- 1.1372
Power density, conducted	+/- 1.4003
3M Semi Anechoic Chamber / 30M~200M	+/- 4.0138
3M Semi Anechoic Chamber / 200M~1000M	+/- 3.9483
3M Semi Anechoic Chamber / 1GHz~8GHz	+/- 2.5975
3M Semi Anechoic Chamber / 8GHz~18GHz	+/- 2.6112
3M Semi Anechoic Chamber / 18GHz~26GHz	+/- 2.7389
3M Semi Anechoic Chamber / 26GHz~40GHz	+/- 2.9683
3M Semi Anechoic Chamber / 40GHz~60GHz	+/- 1.8509
3M Semi Anechoic Chamber / 60GHz~75GHz	+/- 1.9869
3M Semi Anechoic Chamber / 75GHz~110GHz	+/- 2.9651
3M Semi Anechoic Chamber / 110GHz~170GHz	+/- 2.7807
3M Semi Anechoic Chamber / 170GHz~220GHz	+/- 3.6437
3M Semi Anechoic Chamber / 220GHz~325GHz	+/- 4.2982

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	N/A	Not applicable
Radiation	ED Chiang	-
RF Conducted	Kevin Kuo	-

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
Spectrum Analyzer	R&S	FSV 40	101073	10/5/2016	10/4/2017

3M 966 Chamber Test Site					
Equipment	Manufacturer	Model	S/N	Cal Date	Cal Due
Bilog Antenna	Sunol Sciences	JB3	A030105	07/03/2016	07/02/2017
Horn Antenna	EMCO	3117	00055165	2/20/2017	2/19/2018
Pre-Amplifier	EMCI	EMC 012635	980151	06/23/2016	06/22/2017
Pre-Amplifier	EMEC	EM330	060609	06/08/2016	06/07/2017
Spectrum Analyzer	Agilent	E4446A	US42510252	12/05/2016	12/04/2017
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

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.


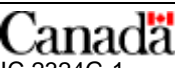
EUT Accessories Equipment					
No.	Equipment	Brand	Model	Series No.	FCC ID
	N/A				

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 Rules.

1.9 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	FCC	3M Semi Anechoic Chamber (FCC MRA: TW1039) to perform FCC Part 15 measurements	 FCC MRA: TW1039
Canada	Industry Canada	3M Semi Anechoic Chamber (IC 2324G-1 / IC 2324G-2) to perform	 IC 2324G-1 IC 2324G-2

* No part of this report may be used to claim or imply product endorsement by A2LA or any agency of the US Government.

2. TEST SUMMERY

Standard Sec.	Chapter	Test Item	Result
15.203	1.2	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	433.92 MHz
RF Filed strength	Peak: 43.04 dBuV/m Average : 21.65 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
DC Voltage	3V
Test Mode	Mode 1: EUT power by battery.
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4
Worst Position	<input type="checkbox"/> Placed in fixed position. <input checked="" type="checkbox"/> Placed in fixed position at X-Plane (E2-Plane) <input type="checkbox"/> Placed in fixed position at Y-Plane (E1-Plane) <input type="checkbox"/> Placed in fixed position at Z-Plane (H-Plane)
Worst Polarity	<input checked="" type="checkbox"/> Horizontal <input type="checkbox"/> Vertical

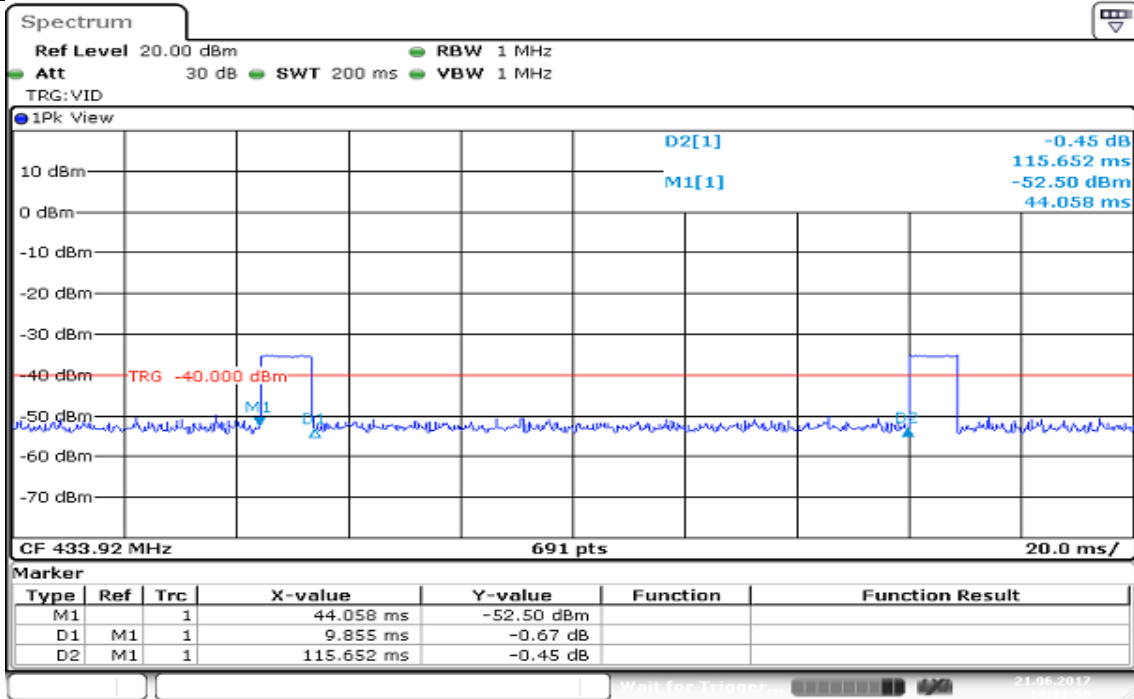
Radiated Emission Measurement Below 1G	
Test Condition	Radiated Emission Below 1G
DC Voltage	3V
Test Mode	Mode 1: EUT power by battery.
Worst Mode	<input checked="" type="checkbox"/> Mode 1 <input type="checkbox"/> Mode 2 <input type="checkbox"/> Mode 3 <input type="checkbox"/> Mode 4

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(X-Plane and Horizontal) were recorded in this report

3.3 EUT DUTY CYCLE

Duty Cycle			
TX ON (ms)	TX ALL (ms)	Duty Cycle (%)	Duty Factor(dB)
9.8550	115.6562	8.52%	-21.39



Date: 21 JUN 2017 14:11:55

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

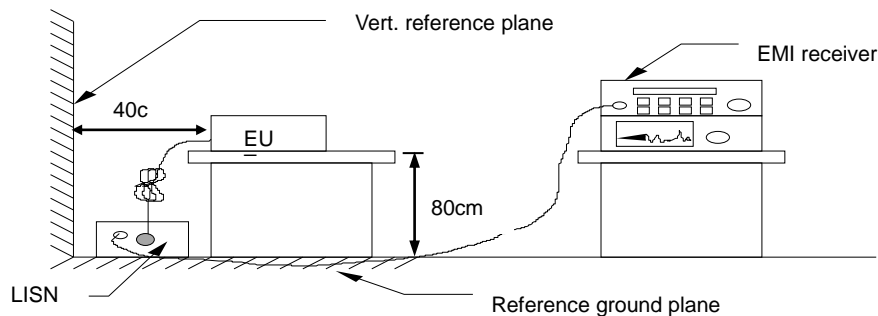
* Decreases with the logarithm of the frequency.

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) ,

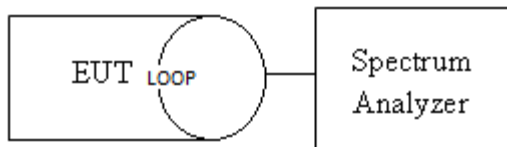
Limit	<input checked="" type="checkbox"/> 70 MHz - 900 MHz : $F_c * 0.25 \%$ <input type="checkbox"/> Above 900 MHz : $F_c * 0.5 \%$
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4.2.2 Test Procedure

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 ≥ 3 x RBW, 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 and Occupied Bandwidth(99%).

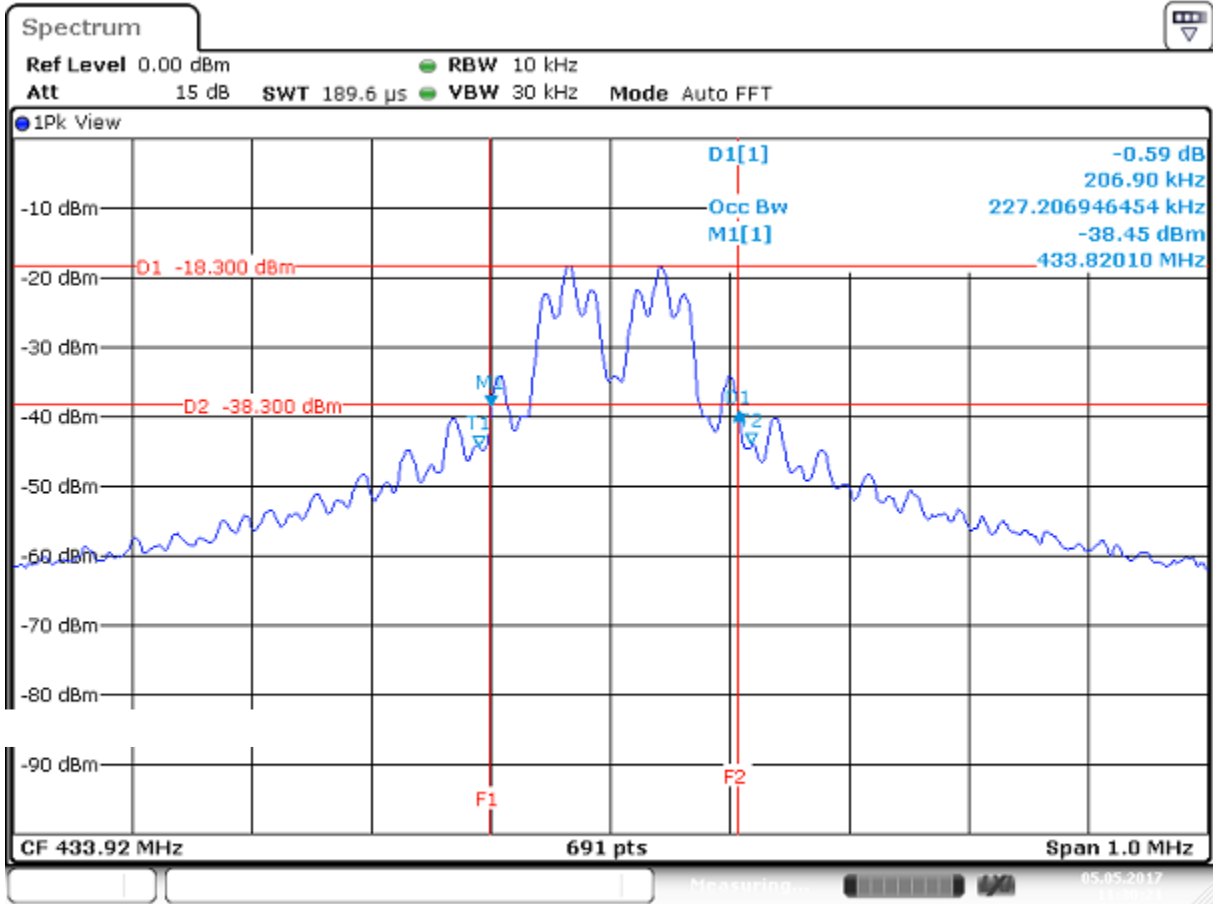
4.2.3 Test Setup



4.2.4 Test Result

Spectrum Bandwidth			
Frequency (MHz)	99% Occupied BW (KHz)	20dB Bandwidth (KHz)	20dB Bandwidth Limits (MHz)
433.92	227.206	206.90	1.08

Test Data



Date: 5.MAY.2017 11:30:21

4.3 FIELD STRENGTH OF FUNDAMENTAL

4.3.1 Test Limit

According to §15.231(b)

Fundamental frequency (MHz)	Field strength of fundamental (uv/m) at 3m	Field strength of fundamental (dBuv/m) at 3m
40.66-40.70	2,250	67
70-130	1,250	61.9
*130-174	*1,250 to 3,750	61.9-71.5
174-260	3,750	71.5
*260-470	*3,750 to 12,500	71.5-81.9
Above 470	12,500	81.9

REMARK:

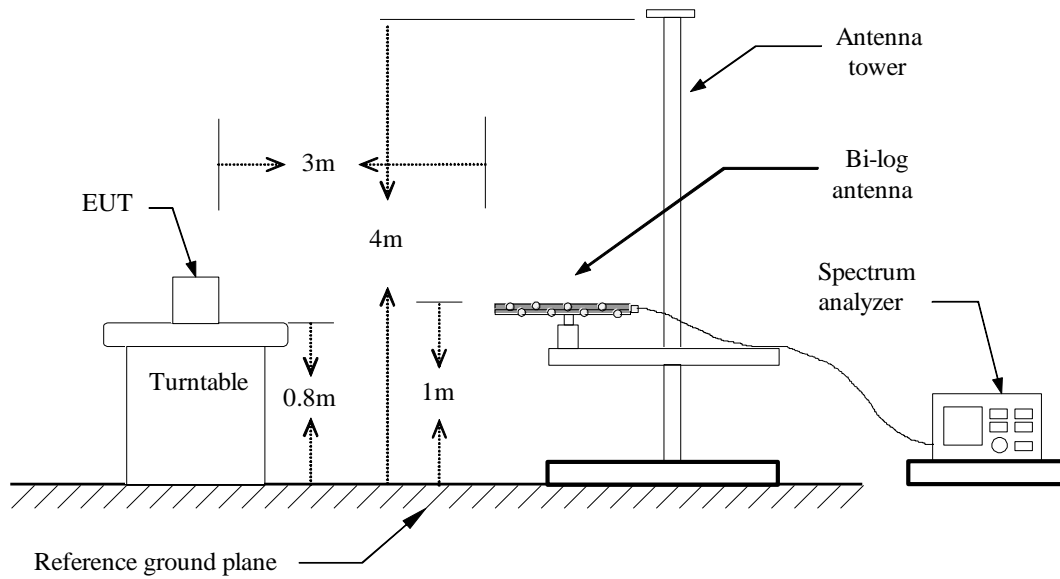
1. Linear interpolations
2. Based on the average value of the measured Field strength of fundamental.

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	<input checked="" type="checkbox"/> 4.1.4.2.2: Measurement Peak value. <input type="checkbox"/> 4.1.4.2.3: Duty cycle ≥ 100%. <input checked="" type="checkbox"/> 4.1.4.2.4: Measurement Average value.
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4.3.3 Test Setup



4.3.4 Test Result

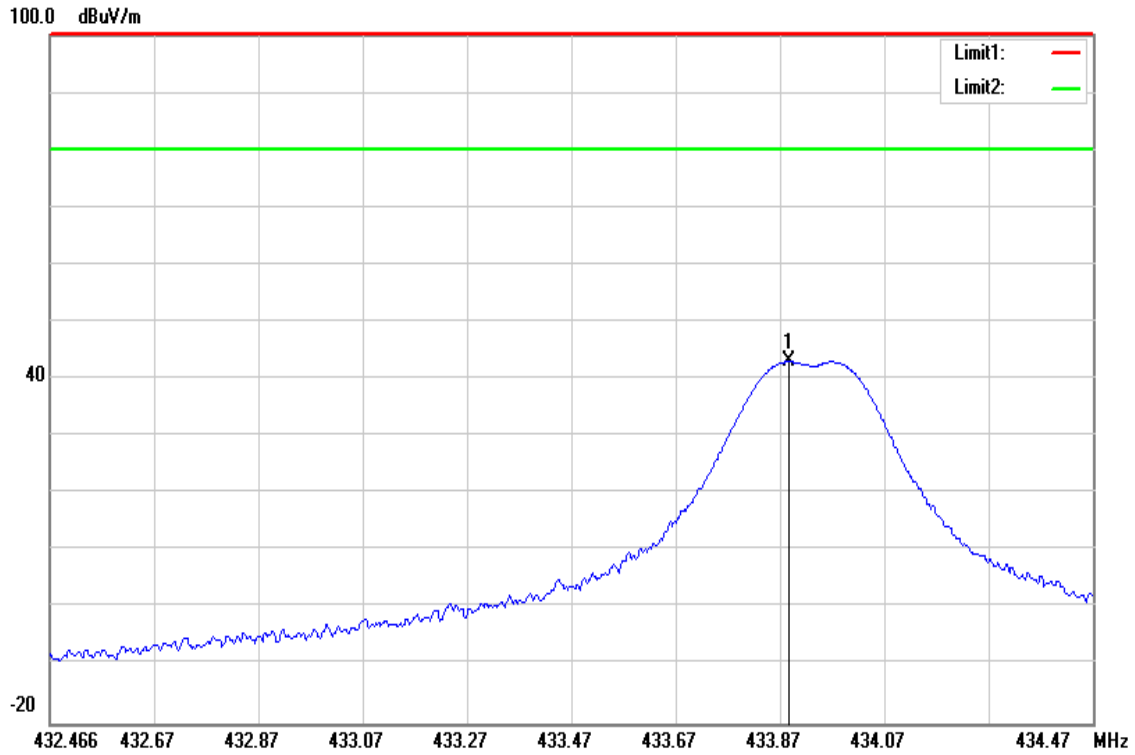
Field Strength					
Frequency (MHz)	Fundamental (dBuV/m) at 3m	Limit (dBuV/m) at 3m	Margin (dB)	Axis/Pol.	Remark
433.92	21.65	80.14	-58.49	X/H	Avg

Remark:

1. Fundamental measured method setting on spectrum, RBW=100 kHz, VBW=100kHz and Detector=Peak.
2. Average result = Peak result + Duty factor

Test Data

Test Mode:	TX	Temp/Hum	27(°C)/ 53%RH
Test Item	Fundamental	Test Date	2017/5/9
Axis/Polarize	X-Plane/Hor	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	3Vdc



No	Frequency (MHz)	Reading (dBuV)	Correct Factor(dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1	433.8820	92.21	-49.17	43.04	100.14	-57.10	peak

4.4 RADIATION UNWANTED EMISSION

4.4.1 Test Limit

According to §15.231(e) and §15.209

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 Spurious emission (uv/m) at 3m	Field strength of Spurious emission (dBuv/m) at 3m
40.66-40.70	225	47
70-130	125	41.9
*130-174	*125-375	41.9-51.5
174-260	375	51.5
*260-470	*375-1250	51.5-61.9
Above 470	1250	61.9

REMARK:

1. Linear interpolations
2. Based on the average value of the measured Field strength of fundamental.

Below 30MHz

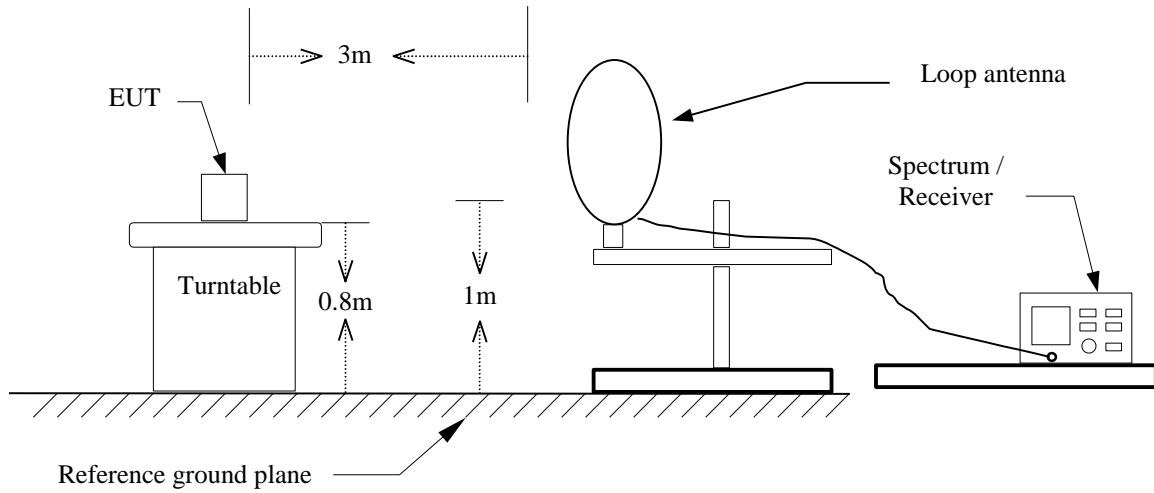
Frequency (MHz)	Field Strength				
	(µV/m)	(dBµV/m)	Measurement Distance (meter)	(dBµV/m)	Measurement Distance (meter)
0.009 - 0.490	2400/F(kHz)	48.52 – 13.80	300	128.52–104.84	3
0.490 - 1.705	24000/F(kHz)	33.80 – 22.97	30	73.80– 62.97	3
1.705 – 30.0	30	29.54	30	69.54	3

Above 30MHz

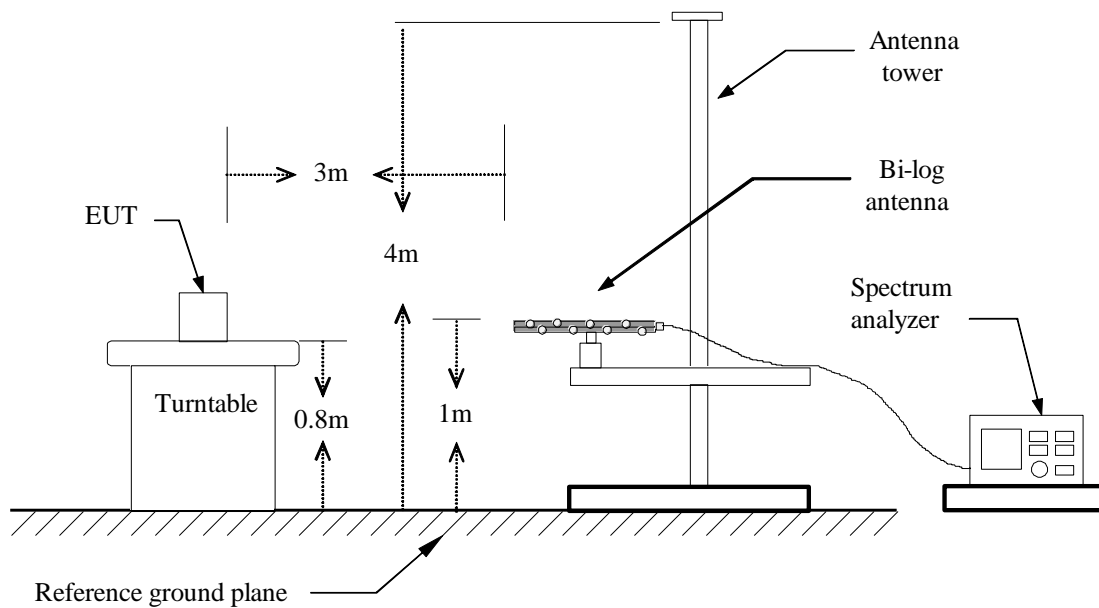
Frequency (MHz)	Field Strength		Measurement Distance (meter)
	(µV/m)	(dBµV/m)	
30-88	100	40.0	3
88-216	150	43.5	3
216-960	200	46.0	3
Above 960	500	54.0	3

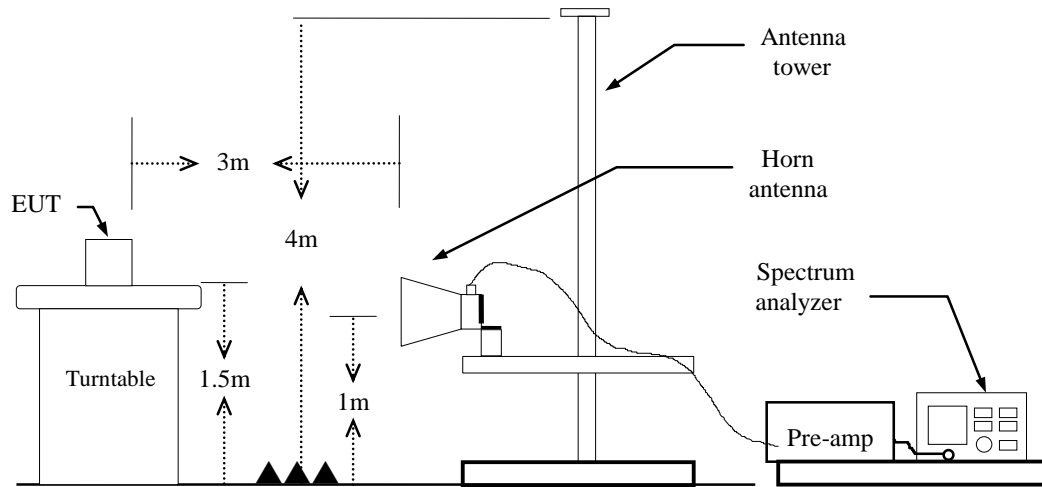
4.4.3 Test Setup

9kHz ~ 30MHz



30MHz ~ 1 GHz

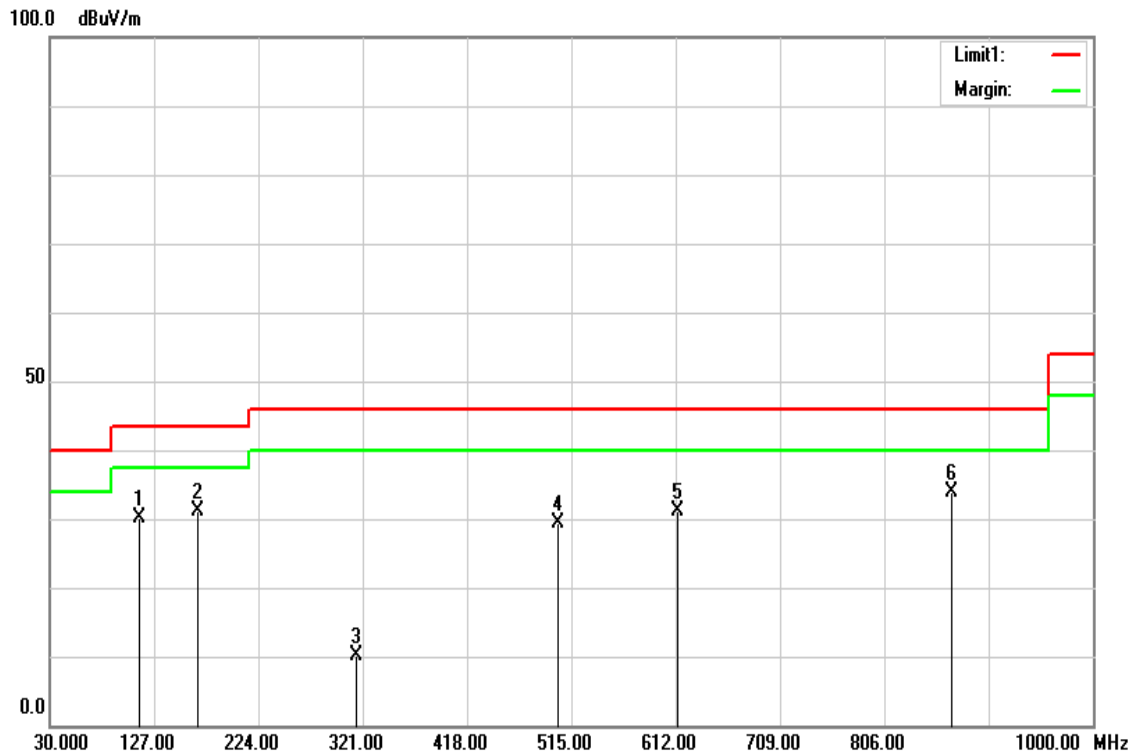


Above 1 GHz**4.4.4 Test Result****Pass.**

Test Data

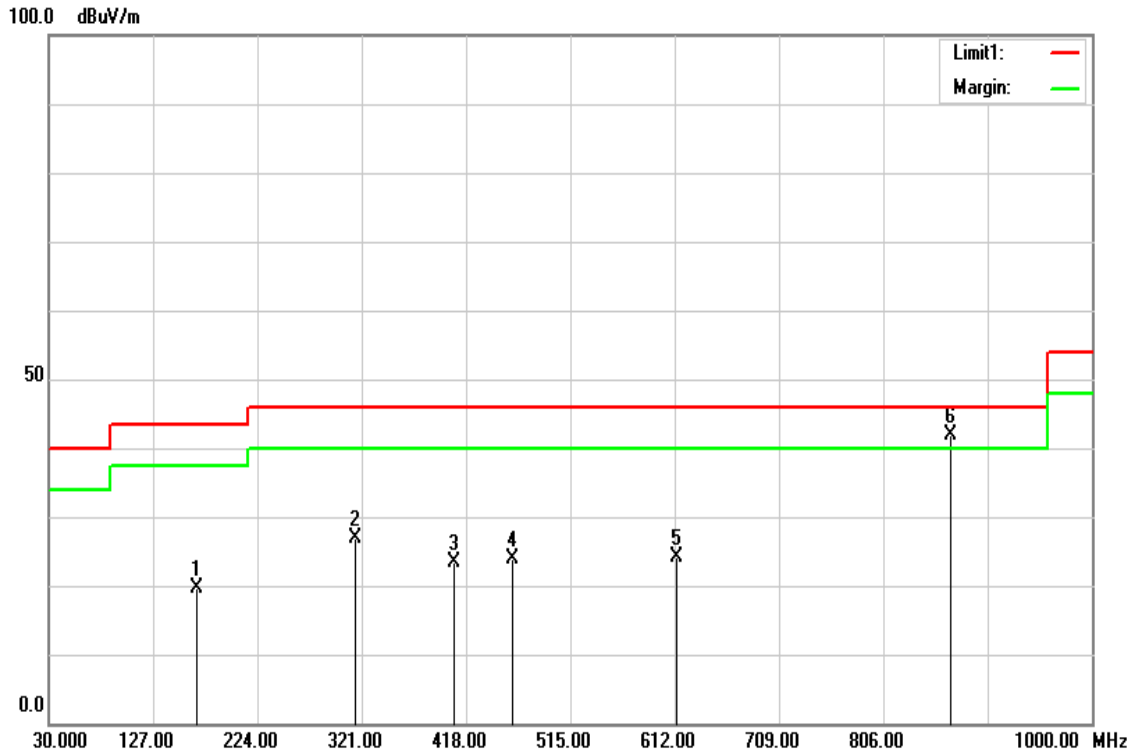
Below 1GHz

Test Mode:	TX	Temp/Hum	27(°C)/ 53%RH
Test Item	Below 1GHz	Test Date	2017/5/2
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	3Vdc



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
113.4200	46.78	-16.66	30.12	43.50	-13.38	peak
167.7400	47.93	-16.74	31.19	43.50	-12.31	peak
315.1800	23.94	-13.83	10.11	46.00	-35.89	QP
502.3900	38.51	-9.20	29.31	46.00	-16.69	peak
613.9400	38.56	-7.43	31.13	46.00	-14.87	peak
868.0800	37.36	-3.57	33.79	46.00	-12.21	peak

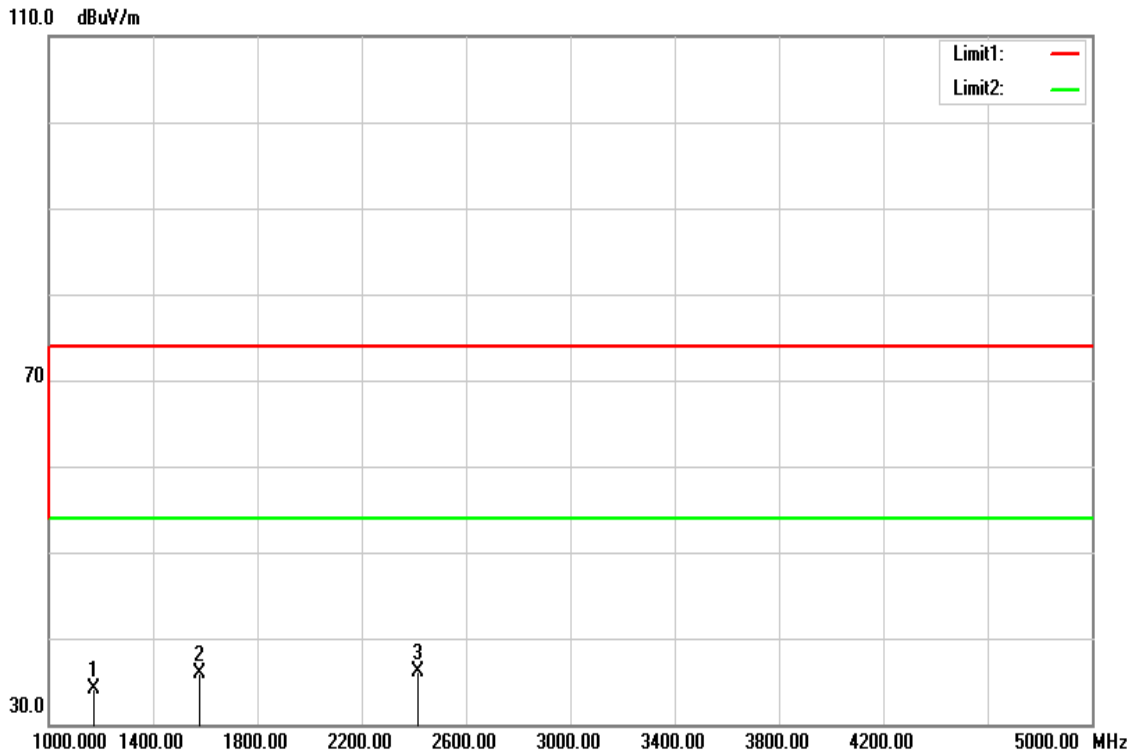
Test Mode:	TX	Temp/Hum	27(°C)/ 53%RH
Test Item	Below 1GHz	Test Date	2017/5/2
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	3Vdc



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
167.7400	36.44	-16.74	19.70	43.50	-23.80	peak
315.1800	40.66	-13.83	26.83	46.00	-19.17	peak
406.3600	34.80	-11.51	23.29	46.00	-22.71	peak
461.6500	33.88	-9.97	23.91	46.00	-22.09	peak
613.9400	31.53	-7.43	24.10	46.00	-21.90	peak
868.0800	45.37	-3.57	41.80	46.00	-4.20	QP

Above 1GHz

Test Mode:	TX	Temp/Hum	27(°C)/ 53%RH
Test Item	Above 1GHz	Test Date	2017/7/14
Polarize	Vertical	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	3Vdc

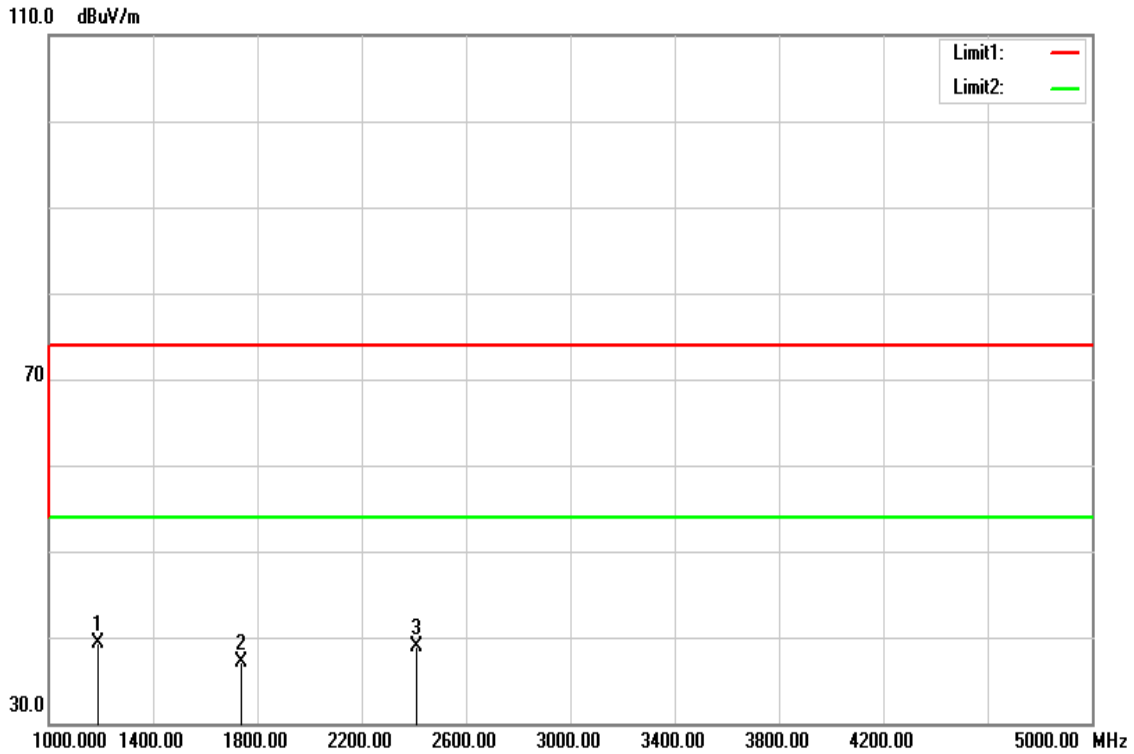


Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1172.000	41.50	-7.34	34.16	74.00	-39.84	peak
1580.000	41.63	-5.78	35.85	74.00	-38.15	peak
2416.000	38.51	-2.39	36.12	74.00	-37.88	peak

Remark:

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

Test Mode:	TX	Temp/Hum	27(°C)/ 53%RH
Test Item	Above 1GHz	Test Date	2017/7/14
Polarize	Horizontal	Test Engineer	Kevin Kuo
Detector	Peak	Test Voltage:	3Vdc



Frequency (MHz)	Reading (dBuV)	Correction Factor (dB/m)	Result (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Remark
1188.000	46.51	-7.28	39.23	74.00	-34.77	peak
1736.000	41.98	-4.97	37.01	74.00	-36.99	peak
2408.000	41.43	-2.43	39.00	74.00	-35.00	peak

Remark:

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

4.5 OPERATION RESTRICTION

4.5.1 Test Limit

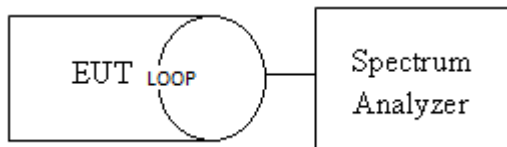
15.231(a)(1), A manually operated transmitter shall employ a switch that will automatically deactivate the transmitter within not more than 5 seconds of being released.

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 $\geq 3 \times$ RBW, Detector = Peak, Trace mode = Max hold, Sweep = 200s.Measure

4.5.3 Test Setup



4.5.4 Test Result

Dwell Time		
Operation condition	Burst Duration	Limits
Automatically Operated	340.58 ms	5 sec

Test Data

