FCC Report

Applicant:	Smartree Technology Co., Ltd.
Address of Applicant:	Room 704, Building A, Bangweiyuan, Yongxian Road, Bantian Area, Longgang District, Shenzhen, China
Manufacturer/ Factory:	Smartree Technology Co., Ltd.
Address of Manufacturer/ Factory:	Room 704, Building A, Bangweiyuan, Yongxian Road, Bantian Area, Longgang District, Shenzhen, China
Equipment Under Test (EUT)	
Product Name:	parent monitor
Model No.:	SM24TX
FCC ID:	2AKVZ-SM24TX
Applicable standards:	FCC CFR Title 47 Part 15.247:2016
Date of sample receipt:	January 12, 2017
Date of Test:	January 12-17, 2017
Date of report issued:	January 17, 2017
Test Result :	PASS *

* In the configuration tested, the EUT complied with the standards specified above.

Authorized Signature:

Robinson Lo
Laboratory Manager

This results shown in this test report refer only to the sample(s) tested, this test report cannot be reproduced, except in full, without prior written permission of the company. The report would be invalid without specific stamp of test institute and the signatures of compiler and approver.

2 Version

Version No.	Date	Description
00	*January 17, 2017*	*Original*

Prepared By:	Tiger. Chen	***Date:***	*January 17, 2017*
	Project Engineer		
Check By:	Andy. wu	***Date:***	*January 17, 2017*
	Reviewer		

3 Contents

Page

1 COVER PAGE 1

2 VERSION 2

3 CONTENTS 3

4 TEST SUMMARY 4

5 GENERAL INFORMATION 5

5.1 GENERAL DESCRIPTION OF EUT 5
5.2 TEST MODE 7
5.3 TEST FACILITY 7
5.4 TEST LOCATION 7
5.5 OTHER INFORMATION REQUESTED BY THE CUSTOMER 7
5.6 DESCRIPTION OF SUPPORT UNITS 7

6 TEST INSTRUMENTS LIST 8

7 TEST RESULTS AND MEASUREMENT DATA 9

7.1 ANTENNA REQUIREMENT 9
7.2 CONDUCTED EMISSIONS 10
7.3 CONDUCTED PEAK OUTPUT POWER 15
7.4 20DB EMISSION BANDWIDTH 17
7.5 CARRIER FREQUENCIES SEPARATION 19
7.6 HOPPING CHANNEL NUMBER 21
7.7 DWELL TIME 22
7.8 PSEUDORANDOM FREQUENCY HOPPING SEQUENCE 23
7.9 BAND EDGE 24
7.9.1 Conducted Emission Method 24
7.9.2 Radiated Emission Method 26
7.10 SPURIOUS EMISSION 28
7.10.1 Conducted Emission Method 28
7.10.2 Radiated Emission Method 30

8 TEST SETUP PHOTO 36

9 EUT CONSTRUCTIONAL DETAILS 38

4 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Pass
AC Power Line Conducted Emission	15.207	Pass
Conducted Peak Output Power	15.247 (b)(1)	Pass
20dB Occupied Bandwidth	15.247 (a)(1)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(1)	Pass
Dwell Time	15.247 (a)(1)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)	Pass
Radiated Emission	15.205/15.209	Pass
Band Edge	15.247(d)	Pass

Pass: The EUT complies with the essential requirements in the standard.

Remark: Test according to ANSI C63.4:2014 and ANSI C63.10:2013

Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	± 4.34dB	(1)
Radiated Emission	30MHz ~ 1000MHz	± 4.24dB	(1)
Radiated Emission	1GHz ~ 26.5GHz	± 4.68dB	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	± 3.45dB	(1)
Note (1): The measurement uncertainty is for coverage factor of k=2 and a level of confidence of 95%.			

5 General Information

5.1 General Description of EUT

Product Name:	parent monitor
Model No.:	SM24TX
Operation Frequency:	2410.875MHz~2471.625MHz
Channel Numbers:	19
Channel Separation:	3.375MHz
Modulation Type:	GFSK
Antenna Type:	Integrity Antenna
Antenna Gain:	0dBi
Power Supply:	AC Adapter: Model:K05S050060U Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 0.6A Adaptor: Model:EP19-050060WXLA Input: AC 100-240V, 50/60Hz, 200mA Max. Output: DC 5V, 0.6A

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2410.875	6	2427.750	11	2444.625	16	2461.500
2	2414.250	7	2431.125	12	2448.000	17	2464.875
3	2417.625	8	2434.500	13	2451.375	18	2468.250
4	2421.000	9	2437.875	14	2454.750	19	2471.625
5	2424.375	10	2441.250	15	2458.125	20	

Note:

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

Channel	Frequency
The lowest channel	2410.875
The middle channel	2441.250
The Highest channel	2471.625

5.2 Test mode

Transmitting mode	keep the EUT in continuously transmitting mode
Remark: During the test, the test voltage was tuned from 85% to 115% of the nominal rated supply voltage, and found that the worst case was under the nominal rated supply condition. So the report just shows that condition's data.	

5.3 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

● **FCC —Registration No.: 600491**

Global United Technology Services Co., Ltd., Shenzhen EMC Laboratory has been registered and fully described in a report filed with the (FCC) Federal Communications Commission. The acceptance letter from the FCC is maintained in files. Registration 600491, June 22, 2016.

● **Industry Canada (IC) —Registration No.: 9079A-2**

The 3m Semi-anechoic chamber of Global United Technology Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 9079A-2, August 15, 2016.

5.4 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.
Address: No. 301-309, 3/F., Jinyuan Business Building, No.2, Laodong Industrial Zone, Xixiang Road, Baoan District, Shenzhen, Guangdong, China 518102
Tel: 0755-27798480
Fax: 0755-27798960

5.5 Other Information Requested by the Customer

None.

5.6 Description of Support Units

None.

6 Test Instruments list

Radiated Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	June 29 2016	June 28 2017
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	June 29 2016	June 28 2017
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	June 29 2016	June 28 2017
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 29 2016	June 28 2017
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	June 29 2016	June 28 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	June 29 2016	June 28 2017
10	Coaxial Cable	GTS	N/A	GTS211	June 29 2016	June 28 2017
11	Coaxial cable	GTS	N/A	GTS210	June 29 2016	June 28 2017
12	Coaxial Cable	GTS	N/A	GTS212	June 29 2016	June 28 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	June 29 2016	June 28 2017
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	June 29 2016	June 28 2017
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 29 2016	June 28 2017
16	Band filter	Amindeon	82346	GTS219	June 29 2016	June 28 2017

Conducted Emission:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Shielding Room	ZhongYu Electron	7.3(L)x3.1(W)x2.9(H)	GTS252	May.16 2014	May.15 2019
2	EMI Test Receiver	R&S	ESCI 7	GTS552	June. 29 2016	June. 28 2017
3	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	June. 29 2016	June. 28 2017
4	Artificial Mains Network	SCHWARZBECK MESS	NSLK8127	GTS226	June. 29 2016	June. 28 2017
5	Coaxial Cable	GTS	N/A	GTS227	June. 29 2016	June. 28 2017
6	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
7	Thermo meter	KTJ	TA328	GTS233	June. 29 2016	June. 28 2017

General used equipment:						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (mm-dd-yy)**	**Cal.Due date (mm-dd-yy)**
1	Barometer	ChangChun	DYM3	GTS257	June 29 2016	June 28 2017

7 Test results and Measurement Data

7.1 Antenna requirement

Standard requirement:	FCC Part15 C Section 15.203 /247(c)

15.203 requirement:

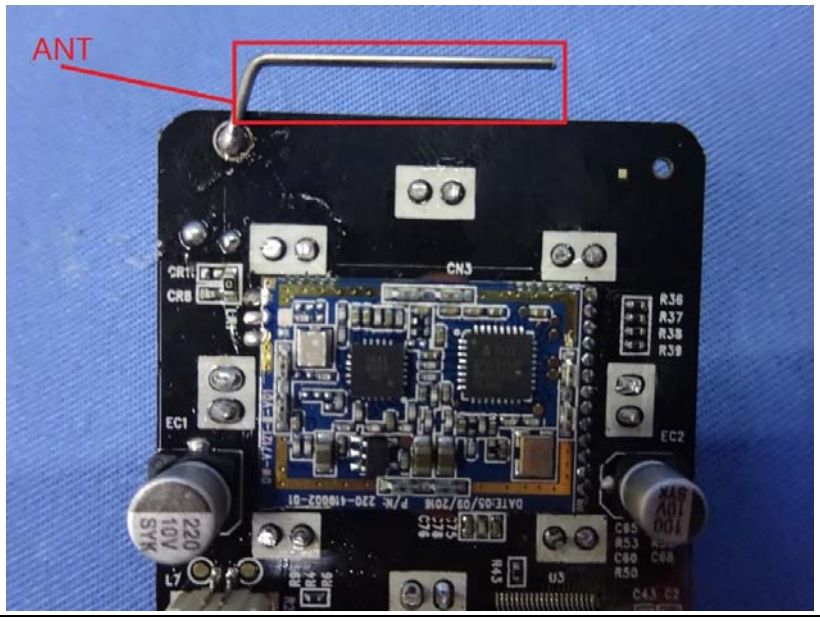
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

15.247(c) (1)(i) requirement:

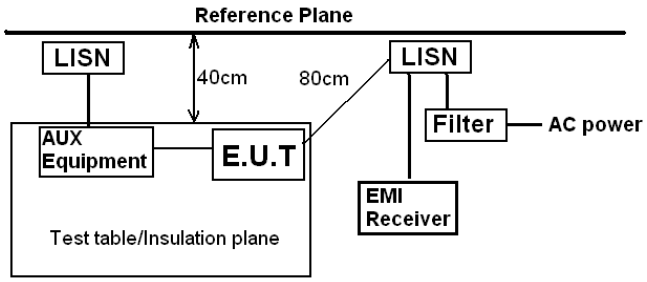
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional gain of the antenna exceeds 6dBi.

E.U.T Antenna:

The antenna is integrity antenna, the best case gain of the antenna is 0 dBi



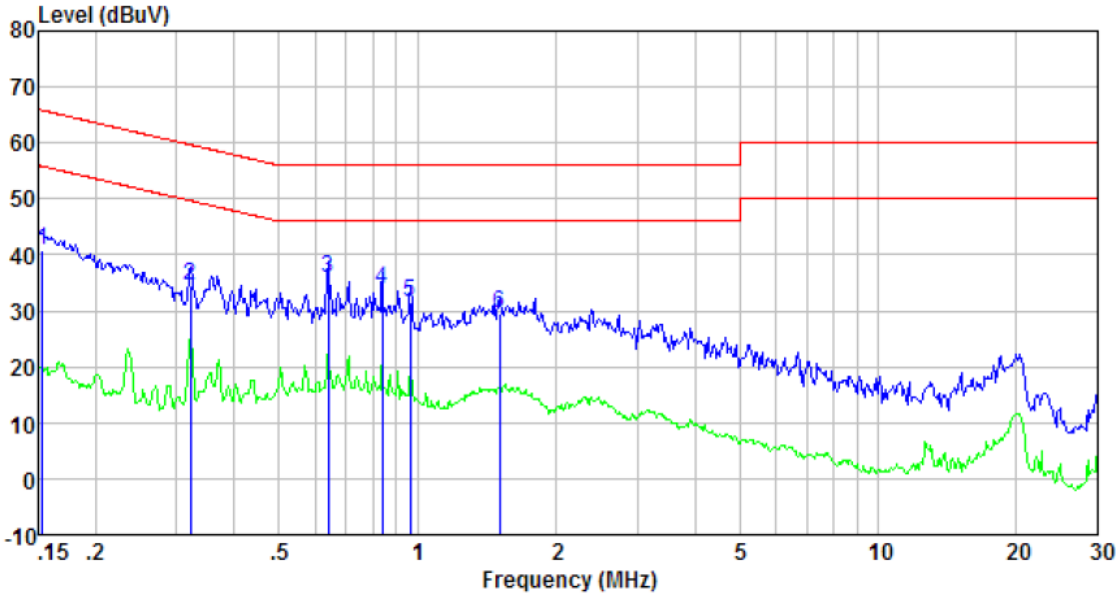
7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207
Test Method:	ANSI C63.10:2013
Test Frequency Range:	150KHz to 30MHz
Class / Severity:	Class B
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto
Limit:	<table><tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr><tr><td>Quasi-peak</td><td>Average</td></tr><tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr><tr><td>0.5-5</td><td>56</td><td>46</td></tr><tr><td>5-30</td><td>60</td><td>50</td></tr></table> * Decreases with the logarithm of the frequency.
Test setup:	 *Remark:* *E.U.T: Equipment Under Test* *LISN: Line Impedence Stabilization Network* *Test table height=0.8m*
Test procedure:	1. The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). This provides a 50ohm/50uH coupling impedance for the measuring equipment. 2. The peripheral devices are also connected to the main power through a LISN that provides a 50ohm/50uH coupling impedance with 50ohm termination. (Please refer to the block diagram of the test setup and photographs). 3. Both sides of A.C. line are checked for maximum conducted interference. In order to find the maximum emission, the relative positions of equipment and all of the interface cables must be changed according to ANSI C63.10:2013 on conducted measurement.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement data:

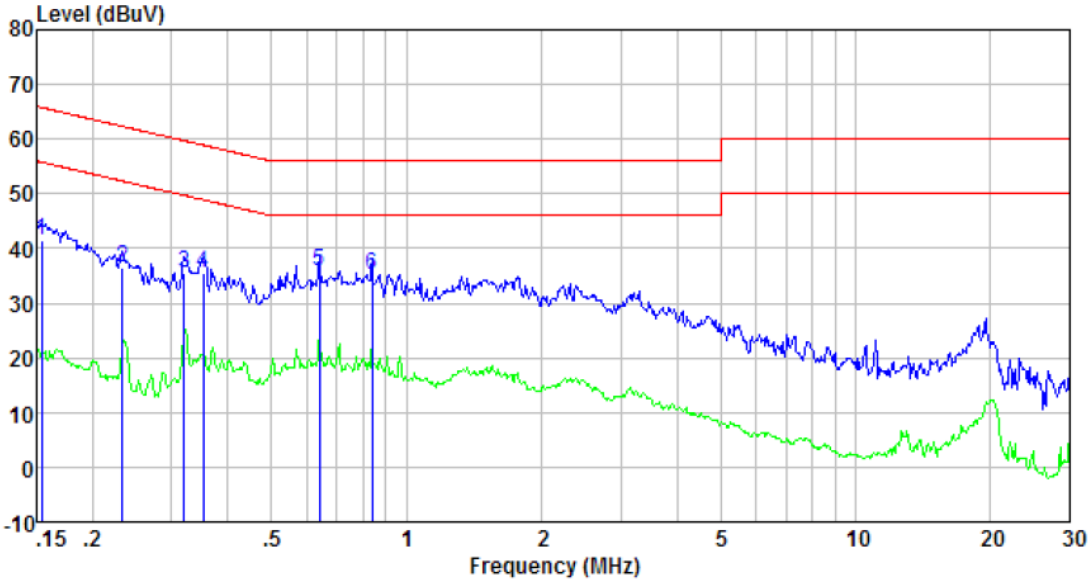
Model No.: K05S050060U

Line:



Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.153	40.24	0.42	0.12	40.78	65.82	-25.04	QP
0.322	34.13	0.43	0.10	34.66	59.66	-25.00	QP
0.641	35.45	0.30	0.13	35.88	56.00	-20.12	QP
0.839	33.38	0.26	0.13	33.77	56.00	-22.23	QP
0.963	31.07	0.25	0.13	31.45	56.00	-24.55	QP
1.503	29.25	0.22	0.14	29.61	56.00	-26.39	QP

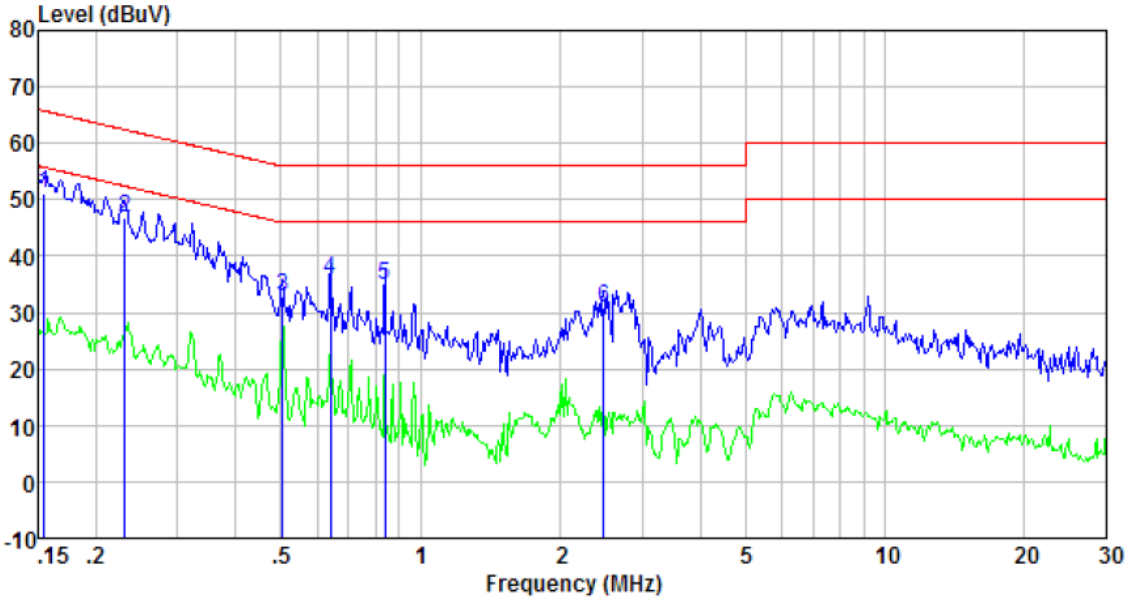
Neutral:



Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.154	40.78	0.41	0.12	41.31	65.78	-24.47	QP
0.233	35.92	0.42	0.12	36.46	62.35	-25.89	QP
0.320	34.88	0.42	0.10	35.40	59.71	-24.31	QP
0.352	35.09	0.41	0.10	35.60	58.91	-23.31	QP
0.641	35.29	0.26	0.13	35.68	56.00	-20.32	QP
0.839	34.66	0.22	0.13	35.01	56.00	-20.99	QP

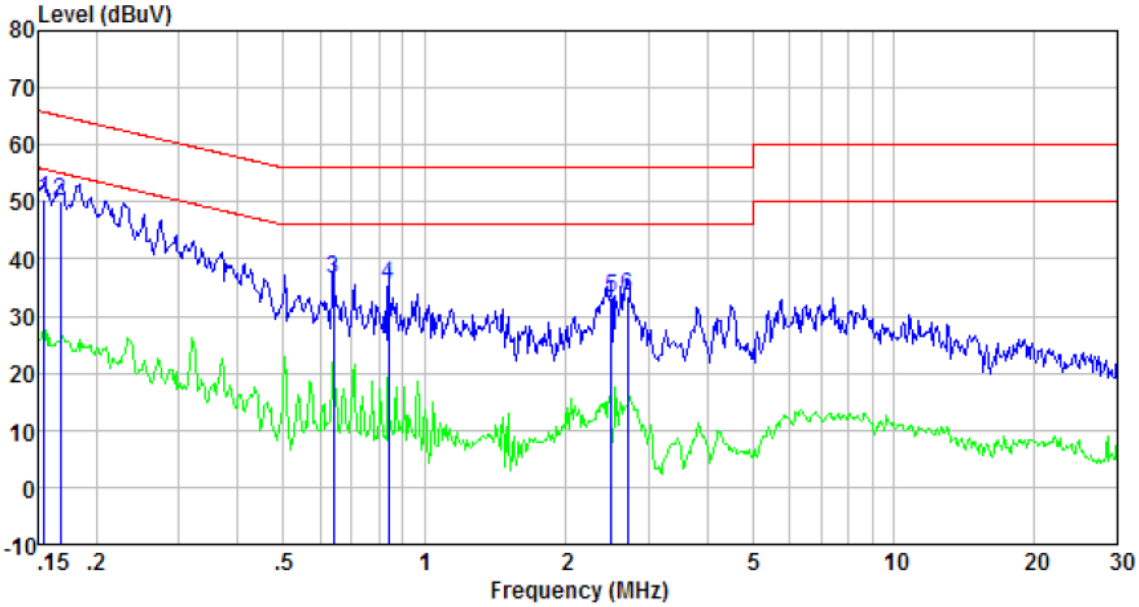
Model No.: EP19-050060WXLA

Line:



Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.155	50.47	0.42	0.12	51.01	65.74	-14.73	QP
0.230	46.37	0.43	0.12	46.92	62.44	-15.52	QP
0.505	32.28	0.38	0.11	32.77	56.00	-23.23	QP
0.641	35.40	0.30	0.13	35.83	56.00	-20.17	QP
0.839	34.56	0.26	0.13	34.95	56.00	-21.05	QP
2.474	30.50	0.20	0.15	30.85	56.00	-25.15	QP

Neutral:

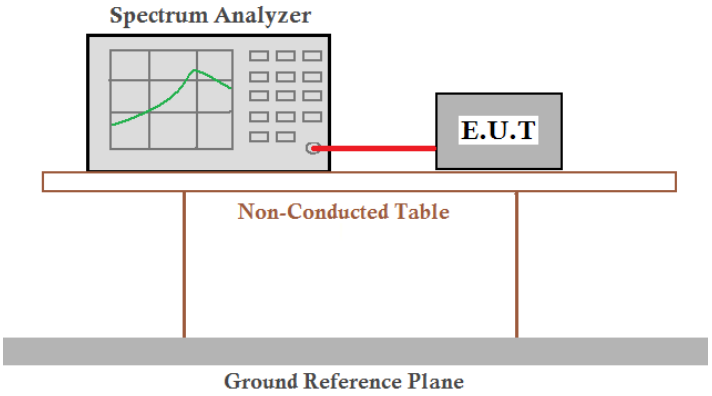


Freq MHz	Reading level dBuV	lISN/ISN factor dB	Cable loss dB	level dBuV	Limit level dBuV	Over limit dB	Remark
0.155	49.88	0.41	0.12	50.41	65.74	-15.33	QP
0.168	49.73	0.41	0.12	50.26	65.08	-14.82	QP
0.641	36.07	0.26	0.13	36.46	56.00	-19.54	QP
0.839	35.12	0.22	0.13	35.47	56.00	-20.53	QP
2.500	32.71	0.20	0.15	33.06	56.00	-22.94	QP
2.707	32.99	0.20	0.15	33.34	56.00	-22.66	QP

Notes:

1. An initial pre-scan was performed on the line and neutral lines with peak detector.
2. Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission.
3. Final Level =Receiver Read level + LISN Factor + Cable Loss
4. *If the average limit is met when using a quasi-peak detector receiver, the EUT shall be deemed to meet both limits and measurement with the average detector receiver is unnecessary.*

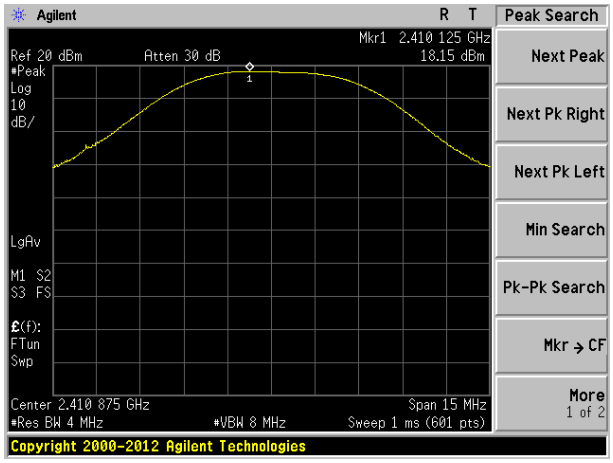
7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.10:2013
Limit:	20.97dBm
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

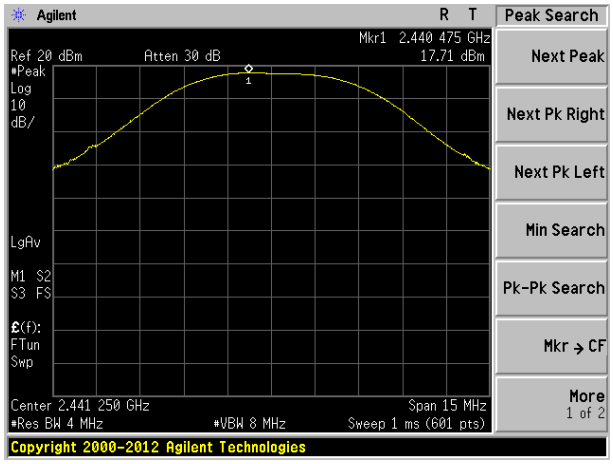
Measurement Data

Test channel	Peak Output Power (dBm)	Limit(dBm)	Result
Lowest	18.15	20.97	Pass
Middle	17.71		
Highest	17.10		

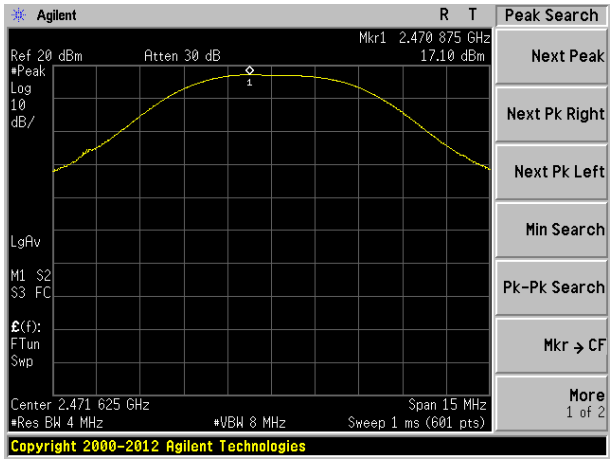
Test plot as follows:



Lowest channel

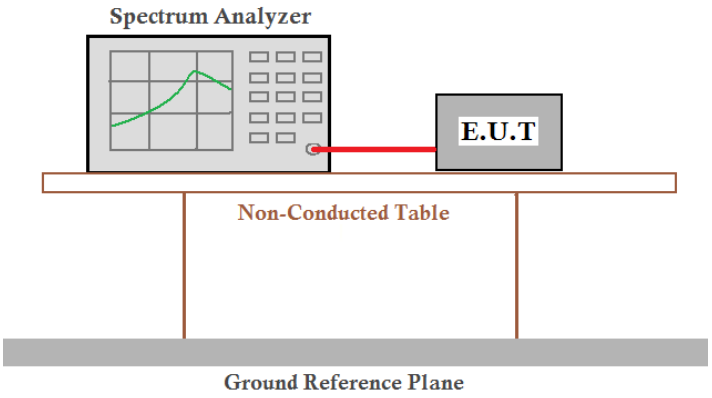


Middle channel



Highest channel

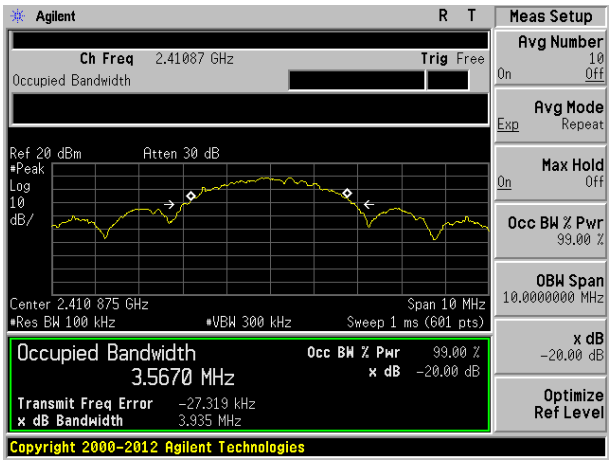
7.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.10:2013
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

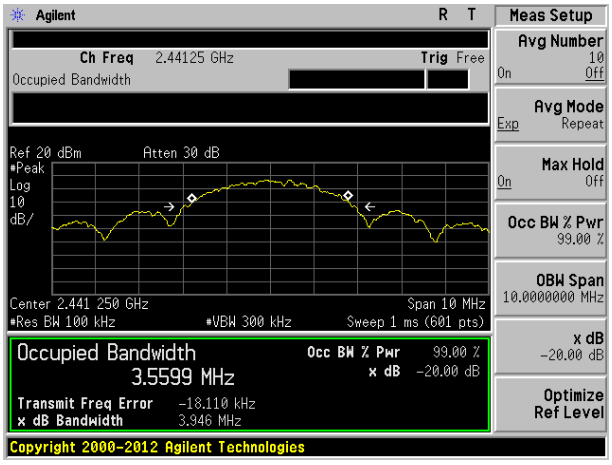
Measurement Data

Test channel	Channel Bandwidth (MHz)	Limit(KHz)	Result
Lowest	3.935	N/A	Pass
Middle	3.946		
Highest	3.918		

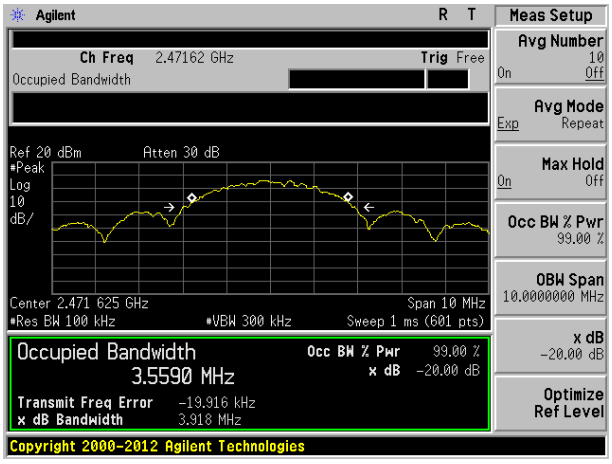
Test plot as follows:



Lowest channel

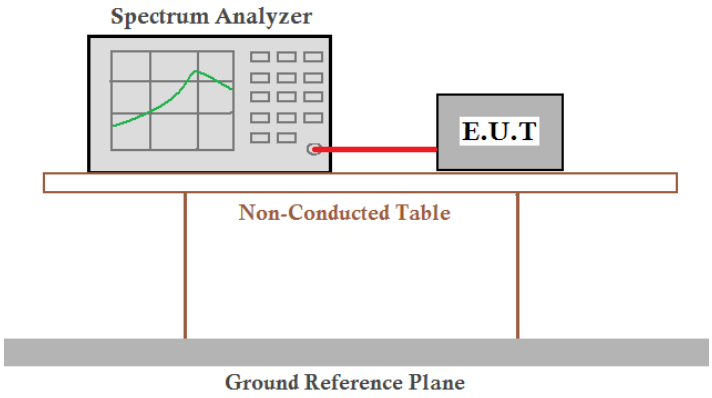


Middle channel



Highest channel

7.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100KHz, VBW=300KHz, detector=Peak
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

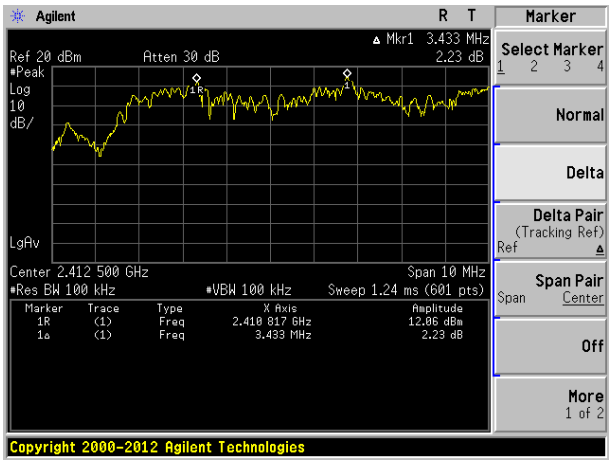
Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	3433	2623.33	Pass
Middle	3367	2630.66	Pass
Highest	3383	2612.00	Pass

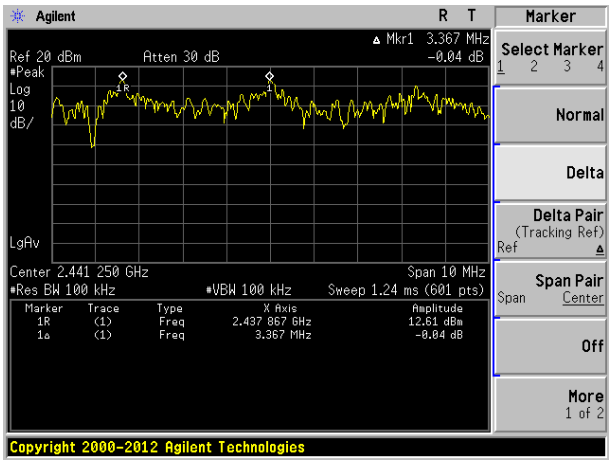
Note: According to section 7.4

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
Lowest	3935	2623.33
Middle	3946	2630.66
Highest	3918	2612.00

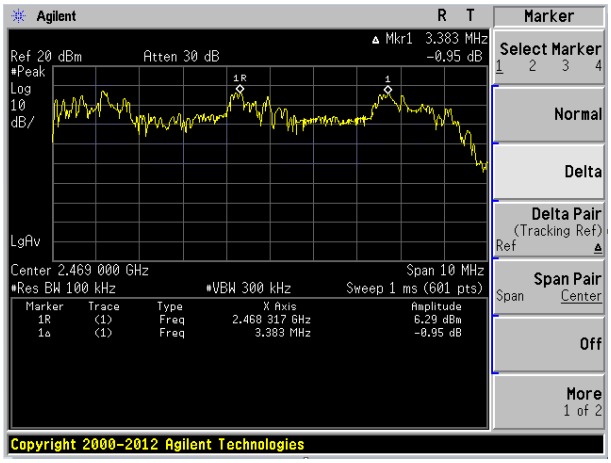
Test plot as follows:



Lowest channel

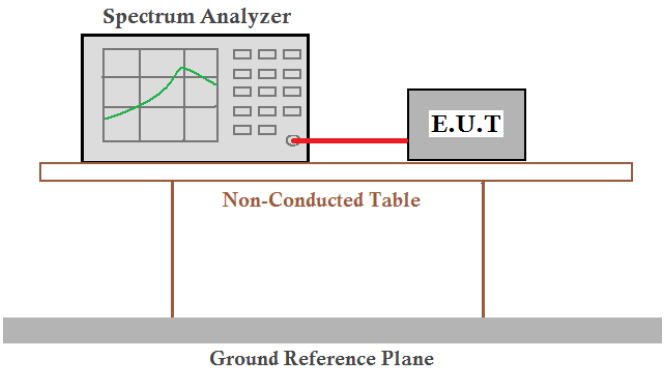


Middle channel



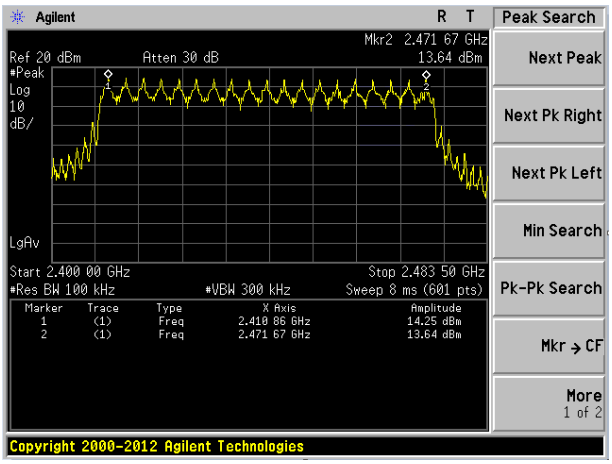
Highest channel

7.6 Hopping Channel Number

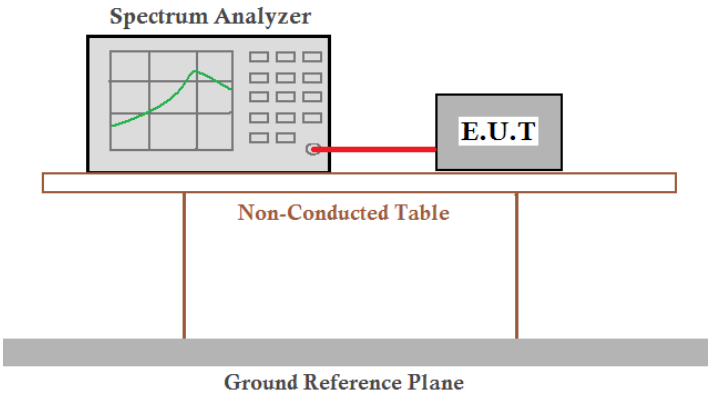
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data:

Hopping channel numbers	Limit	Result
19	15	Pass



7.7 Dwell Time

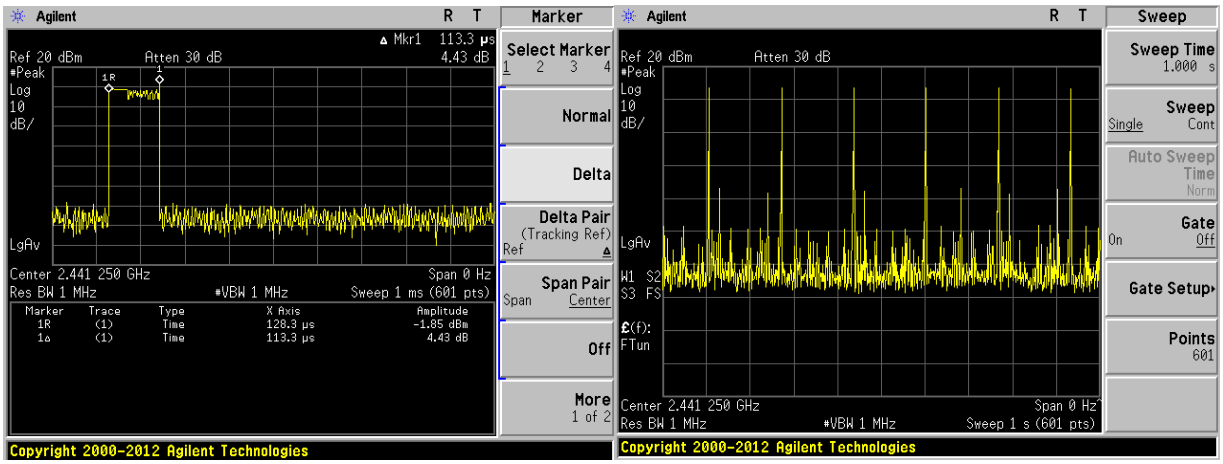
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=1MHz, VBW=1MHz, Span=0Hz, Detector=Peak
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Measurement Data

Frequency	Packet	Dwell time(ms)	Limit(ms)	Result
2441.250MHz	0.1133ms	6hops/1s*T*0.1133 =5.17m s	400	Pass

The test period: T= 0.4 Second/Channel x 19 Channel = 7.6s

Test plot as follows:



7.8 Pseudorandom Frequency Hopping Sequence

Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:

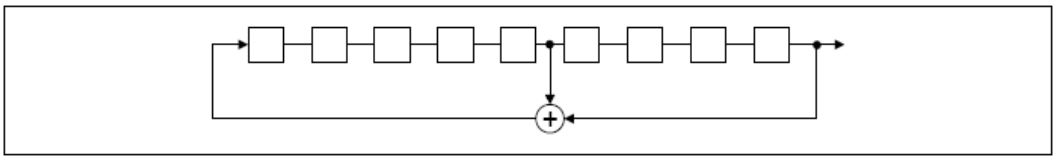
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Alternatively. Frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125 mW. The system shall hop to channel frequencies that are selected at the system hopping rate from a Pseudorandom ordered list of hopping frequencies. Each frequency must be used equally on the average by each transmitter. The system receivers shall have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shall shift frequencies in synchronization with the transmitted signals.

EUT Pseudorandom Frequency Hopping Sequence

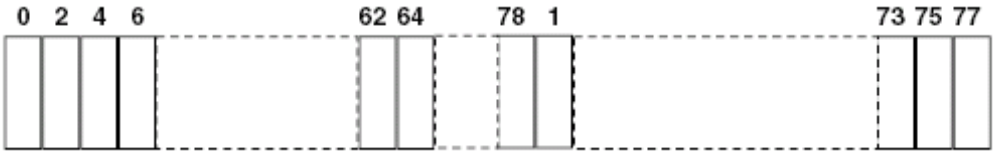
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized with nine ones.

- *Number of shift register stages: 9*
- *Length of pseudo-random sequence: 2^9 -1 = 511 bits*
- *Longest sequence of zeros: 8 (non-inverted signal)*



Linear Feedback Shift Register for Generation of the PRBS sequence

An example of Pseudorandom Frequency Hopping Sequence as follow:

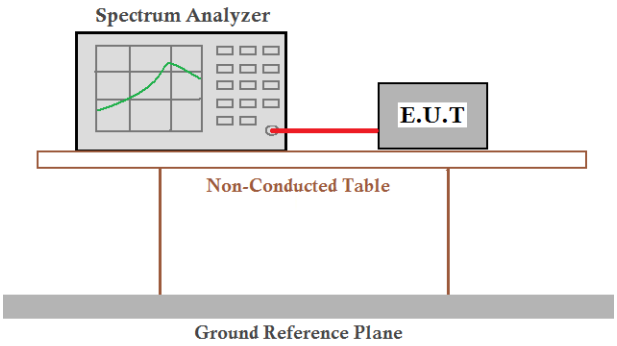


Each frequency used equally on the average by each transmitter.

The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

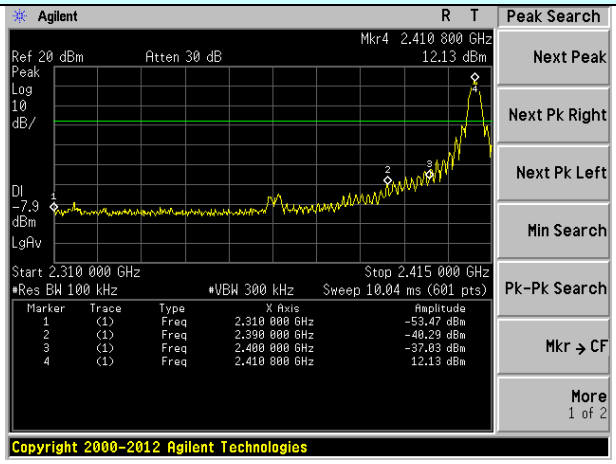
7.9 Band Edge

7.9.1 Conducted Emission Method

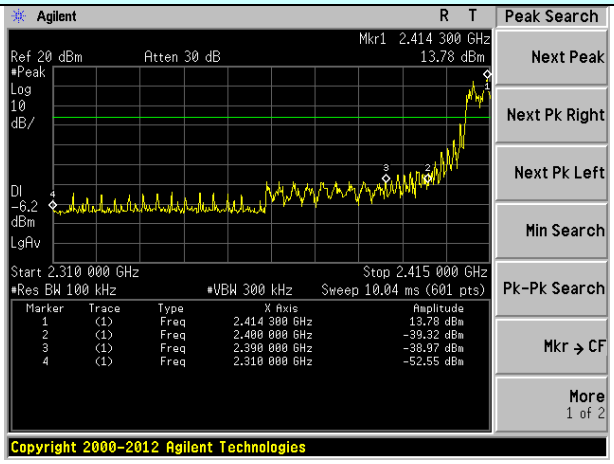
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Test plot as follows:

Test channel:	Lowest channel

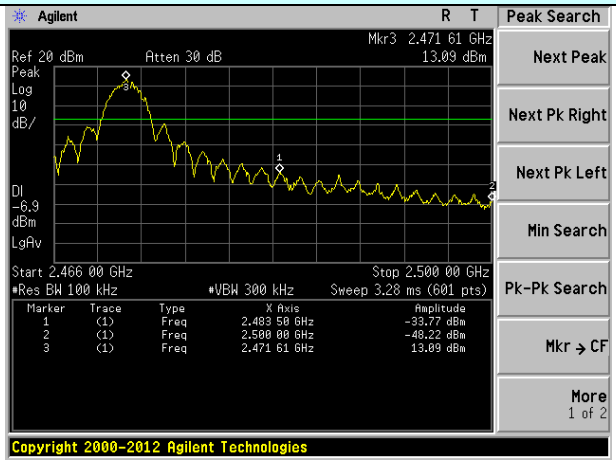


No-hopping mode

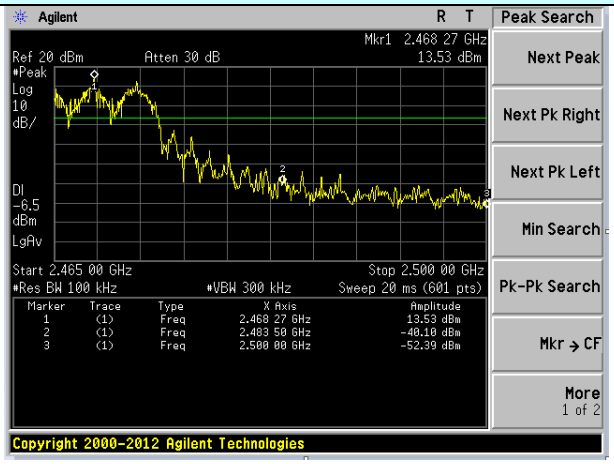


Hopping mode

Test channel:	Highest channel



No-hopping mode



Hopping mode

7.9.2 Radiated Emission Method

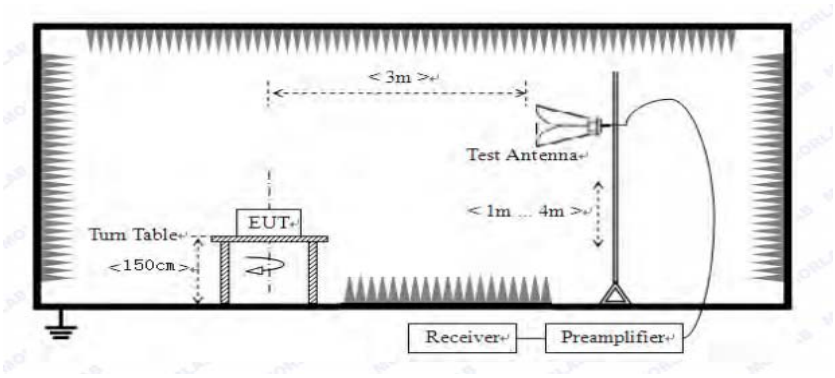
Test Requirement:	FCC Part15 C Section 15.209 and 15.205
Test Method:	ANSI C63.10:2013
Test Frequency Range:	All restriction band have been tested, and 2.3GHz to 2.5GHz band is the worse case
Test site:	Measurement Distance: 3m
Receiver setup:	

Frequency	Detector	RBW	VBW	Remark
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

Frequency	Limit (dBuV/m @3m)	Remark
Above 1GHz	54.00	Average Value
	74.00	Peak Value

Test setup:



Test Procedure:

1. The EUT was placed on the top of a rotating table 1.5 meters above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation.
2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
3. 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.
4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading.
5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
6. 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.

Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2for details

Test results:	Pass

Remark:

Test channel:	Lowest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	48.82	27.59	5.38	30.18	51.61	74.00	-22.39	Horizontal
2400.00	51.17	27.58	5.39	30.18	53.96	74.00	-20.04	Horizontal
2390.00	47.75	27.59	5.38	30.18	50.54	74.00	-23.46	Vertical
2400.00	56.63	27.58	5.39	30.18	59.42	74.00	-14.58	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	36.48	27.59	5.38	30.18	39.27	54.00	-14.73	Horizontal
2400.00	37.95	27.58	5.39	30.18	40.74	54.00	-13.26	Horizontal
2390.00	36.71	27.59	5.38	30.18	39.50	54.00	-14.50	Vertical
2400.00	39.98	27.58	5.39	30.18	42.77	54.00	-11.23	Vertical

Test channel:	Highest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	49.40	27.53	5.47	29.93	52.47	74.00	-21.53	Horizontal
2500.00	47.82	27.55	5.49	29.93	50.93	74.00	-23.07	Horizontal
2483.50	50.90	27.53	5.47	29.93	53.97	74.00	-20.03	Vertical
2500.00	49.19	27.55	5.49	29.93	52.30	74.00	-21.70	Vertical

Average value:

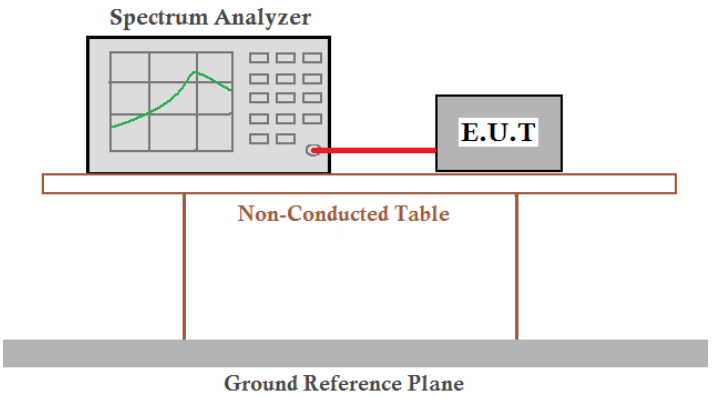
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	39.36	27.53	5.47	29.93	42.43	54.00	-11.57	Horizontal
2500.00	36.79	27.55	5.49	29.93	39.90	54.00	-14.10	Horizontal
2483.50	40.90	27.53	5.47	29.93	43.97	54.00	-10.03	Vertical
2500.00	37.04	27.55	5.49	29.93	40.15	54.00	-13.85	Vertical

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *The emission levels of other frequencies are very lower than the limit and not show in test report.*

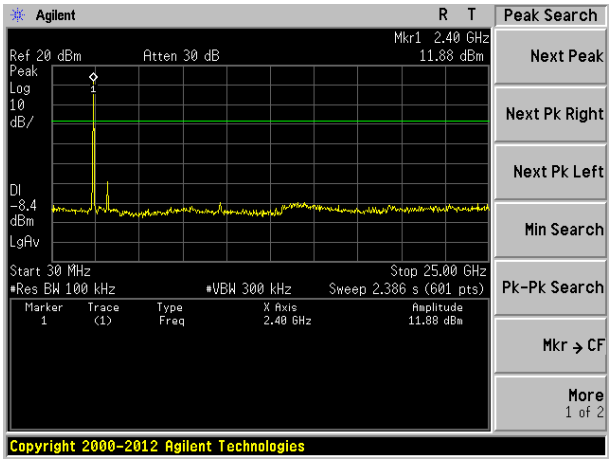
7.10 Spurious Emission

7.10.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 Meas Guidance
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement.
Test setup:	
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

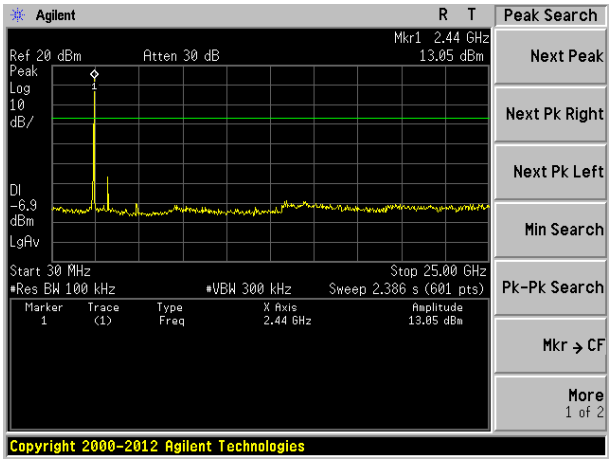
Remark:

Lowest channel



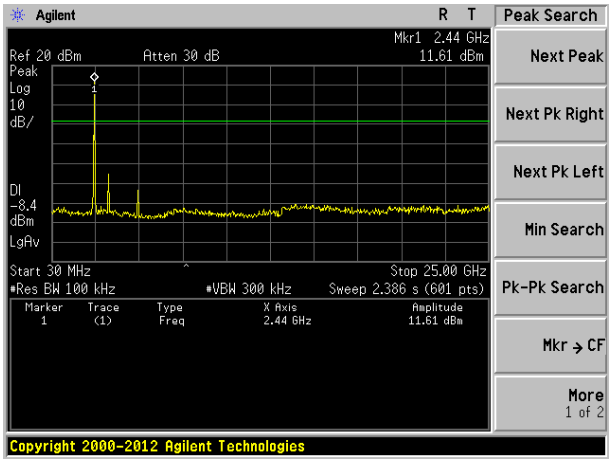
30MHz~25GHz

Middle channel



30MHz~25GHz

Highest channel



30MHz~25GHz

7.10.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209
Test Method:	ANSI C63.10:2013
Test Frequency Range:	30MHz to 25GHz
Test site:	Measurement Distance: 3m
Receiver setup:	

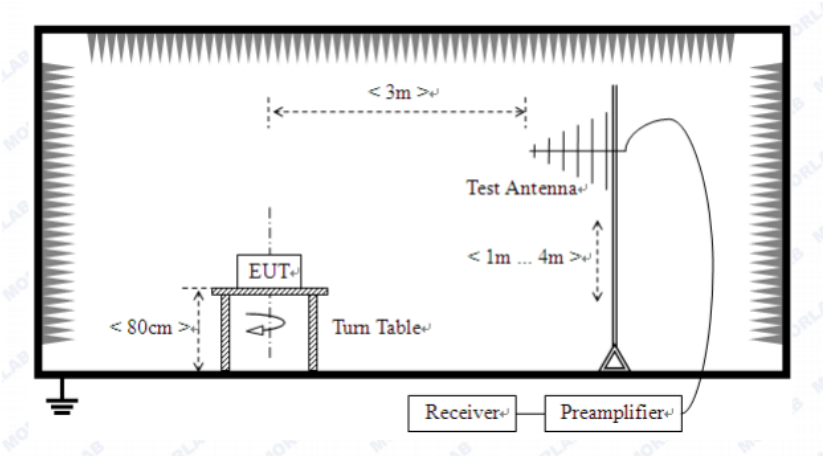
Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	Peak	1MHz	10Hz	Average Value

Limit:

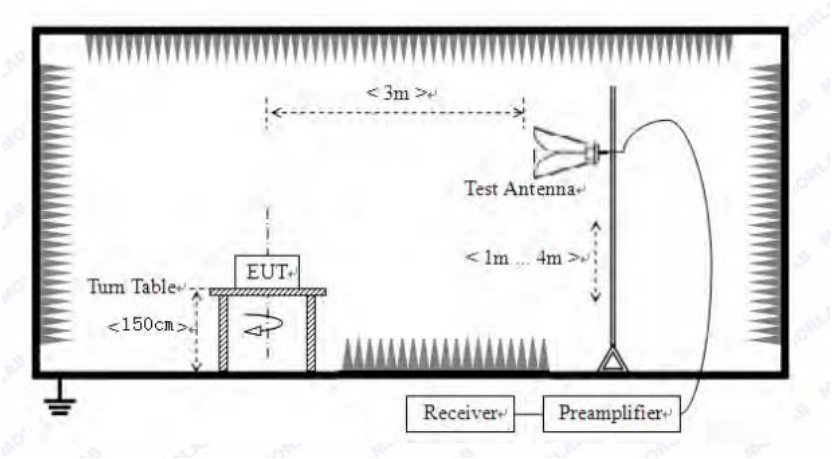
Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test setup:

Below 1GHz



Above 1GHz

	
Test Procedure:	1. The EUT was placed on the top of a rotating table (0.8 meters below 1G and 1.5 meters above 1G) above the ground at a 3 meter camber. The table was rotated 360 degrees to determine the position of the highest radiation. 2. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. 3. 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. 4. 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 and the rota table was turned from 0 degrees to 360 degrees to find the maximum reading. 5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode. 6. 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.
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.2 for details
Test results:	Pass

Remark:

Pre-scan all kind of the place mode (X-axis, Y-axis, Z-axis), and found the Y-axis which it is worse case. Only the worst case shows below.

Measurement data:

■ **Below 1GHz**

Model No.: EP19-050060WXLA

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
167.82	55.12	8.33	1.67	29.33	35.79	43.50	-7.71	Vertical
216.02	48.95	10.78	1.93	29.36	32.30	46.00	-13.70	Vertical
263.82	47.82	12.34	2.19	29.75	32.60	46.00	-13.40	Vertical
312.18	50.44	13.74	2.42	29.93	36.67	46.00	-9.33	Vertical
360.45	44.75	14.68	2.67	29.69	32.41	46.00	-13.59	Vertical
912.86	36.51	22.27	4.90	29.10	34.58	46.00	-11.42	Vertical
167.82	47.95	8.33	1.67	29.33	28.62	43.50	-14.88	Horizontal
216.02	49.07	10.78	1.93	29.36	32.42	46.00	-13.58	Horizontal
312.18	52.29	13.74	2.42	29.93	38.52	46.00	-7.48	Horizontal
360.45	45.79	14.68	2.67	29.69	33.45	46.00	-12.55	Horizontal
408.95	39.46	15.68	2.90	29.48	28.56	46.00	-17.44	Horizontal
672.85	38.04	19.65	3.99	29.23	32.45	46.00	-13.55	Horizontal

■ **Above 1GHz**

Test channel:	Lowest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4821.750	44.37	31.79	14.44	37.67	52.93	74.00	-21.07	Vertical
7232.625	35.53	36.19	16.31	35.68	52.35	74.00	-21.65	Vertical
9643.500	33.84	38.07	18.24	34.92	55.23	74.00	-18.77	Vertical
12054.375	32.41	39.05	19.47	36.14	54.79	74.00	-19.21	Vertical
14465.250	*	*	*	*	*	*	*	Vertical
16876.125	*	*	*	*	*	*	*	Vertical
4821.750	45.57	31.79	14.44	37.67	54.13	74.00	-19.87	Horizontal
7232.625	34.67	36.19	16.31	35.68	51.49	74.00	-22.51	Horizontal
9643.500	33.87	38.07	18.24	34.92	55.26	74.00	-18.74	Horizontal
12054.375	32.73	39.05	19.47	36.14	55.11	74.00	-18.89	Horizontal
14465.250	*	*	*	*	*	*	*	Horizontal
16876.125	*	*	*	*	*	*	*	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4821.750	36.87	31.79	14.44	37.67	45.43	54.00	-8.57	Vertical
7232.625	25.77	36.19	16.31	35.68	42.59	54.00	-11.41	Vertical
9643.500	25.87	38.07	18.24	34.92	47.26	54.00	-6.74	Vertical
12054.375	26.01	39.05	19.47	36.14	48.39	54.00	-5.61	Vertical
14465.250	*	*	*	*	*	*	*	Vertical
16876.125	*	*	*	*	*	*	*	Vertical
4821.750	35.76	31.79	14.44	37.67	44.32	54.00	-9.68	Horizontal
7232.625	26.88	36.19	16.31	35.68	43.70	54.00	-10.30	Horizontal
9643.500	25.03	38.07	18.24	34.92	46.42	54.00	-7.58	Horizontal
12054.375	25.36	39.05	19.47	36.14	47.74	54.00	-6.26	Horizontal
14465.250	*	*	*	*	*	*	*	Horizontal
16876.125	*	*	*	*	*	*	*	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	Middle

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2441.250	50.03	31.85	14.51	37.68	58.71	74.00	-15.29	Vertical
4882.500	36.89	36.37	16.48	35.64	54.10	74.00	-19.90	Vertical
7323.750	33.41	38.35	18.52	34.99	55.29	74.00	-18.71	Vertical
9765.000	31.25	38.92	19.78	36.26	53.69	74.00	-20.31	Vertical
12206.250	*	*	*	*	*	*	*	Vertical
14647.500	*	*	*	*	*	*	*	Vertical
4882.500	48.34	31.85	14.51	37.68	57.02	74.00	-16.98	Horizontal
7323.750	37.85	36.37	16.48	35.64	55.06	74.00	-18.94	Horizontal
9765.000	32.54	38.35	18.52	34.99	54.42	74.00	-19.58	Horizontal
12206.250	31.36	38.92	19.78	36.26	53.80	74.00	-20.20	Horizontal
14647.500	*	*	*	*	*	*	*	Horizontal
17088.750	*	*	*	*	*	*	*	Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
2441.250	38.63	31.85	14.51	37.68	47.31	54.00	-6.69	Vertical
4882.500	30.71	36.37	16.48	35.64	47.92	54.00	-6.08	Vertical
7323.750	25.85	38.35	18.52	34.99	47.73	54.00	-6.27	Vertical
9765.000	24.75	38.92	19.78	36.26	47.19	54.00	-6.81	Vertical
12206.250	*	*	*	*	*	*	*	Vertical
14647.500	*	*	*	*	*	*	*	Vertical
4882.500	37.02	31.85	14.51	37.68	45.70	54.00	-8.30	Horizontal
7323.750	29.22	36.37	16.48	35.64	46.43	54.00	-7.57	Horizontal
9765.000	26.54	38.35	18.52	34.99	48.42	54.00	-5.58	Horizontal
12206.250	26.51	38.92	19.78	36.26	48.95	54.00	-5.05	Horizontal
14647.500	*	*	*	*	*	*	*	Horizontal
17088.750	*	*	*	*	*	*	*	Horizontal

Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*", means this data is the too weak instrument of signal is unable to test.*

Test channel:	Highest

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4943.250	49.12	31.91	14.61	37.69	57.95	74.00	-16.05	Vertical
7414.875	37.06	36.56	16.63	35.60	54.65	74.00	-19.35	Vertical
9886.500	33.44	38.72	18.51	35.05	55.62	74.00	-18.38	Vertical
12358.125	32.25	38.78	20.09	36.38	54.74	74.00	-19.26	Vertical
14829.750	*	*	*	*	*	*	*	Vertical
17301.375	*	*	*	*	*	*	*	Vertical
4943.250	46.71	31.91	14.61	37.69	55.54	74.00	-18.46	Horizontal
7414.875	33.58	36.56	16.63	35.60	51.17	74.00	-22.83	Horizontal
9886.500	32.02	38.72	18.51	35.05	54.20	74.00	-19.80	Horizontal
12358.125	30.49	38.78	20.09	36.38	52.98	74.00	-21.02	Horizontal
14829.750	*	*	*	*	*	*	*	Horizontal
17301.375	*	*	*	*	*	*	*	Horizontal

Average value:

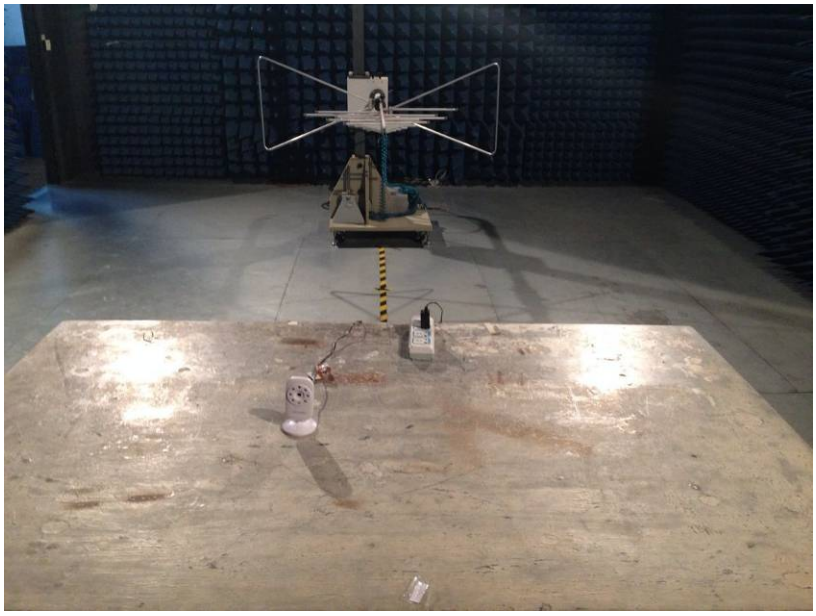
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
4943.250	36.64	31.91	14.61	37.69	45.47	54.00	-8.53	Vertical
7414.875	31.52	36.56	16.63	35.60	49.11	54.00	-4.89	Vertical
9886.500	26.74	38.72	18.51	35.05	48.92	54.00	-5.08	Vertical
12358.125	25.85	38.78	20.09	36.38	48.34	54.00	-5.66	Vertical
14829.750	*	*	*	*	*	*	*	Vertical
17301.375	*	*	*	*	*	*	*	Vertical
4943.250	35.47	31.91	14.61	37.69	44.30	54.00	-9.70	Horizontal
7414.875	32.01	36.56	16.63	35.60	49.60	54.00	-4.40	Horizontal
9886.500	26.54	38.72	18.51	35.05	48.72	54.00	-5.28	Horizontal
12358.125	25.84	38.78	20.09	36.38	48.33	54.00	-5.67	Horizontal
14829.750	*	*	*	*	*	*	*	Horizontal
17301.375	*	*	*	*	*	*	*	Horizontal

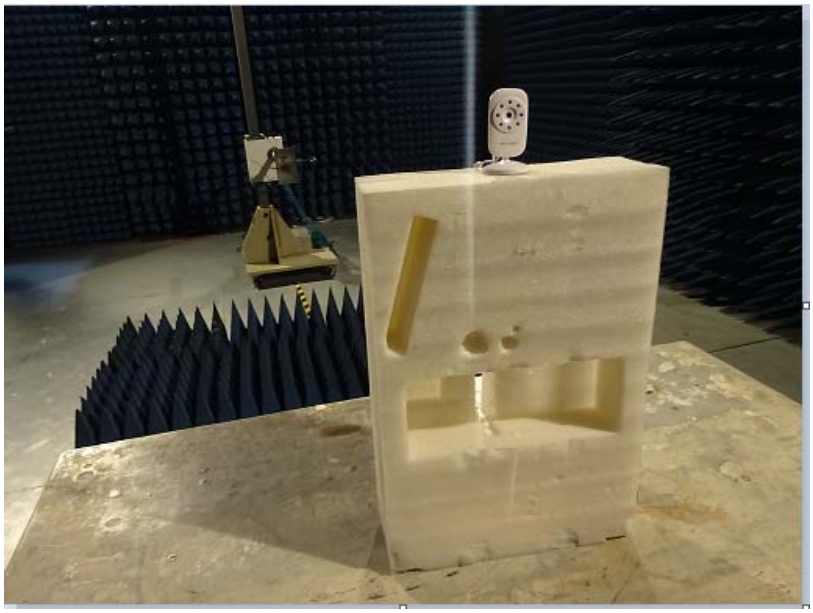
Remark:

1. *Final Level =Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor*
2. *"*" means this data is the too weak instrument of signal is unable to test.*

8 Test Setup Photo

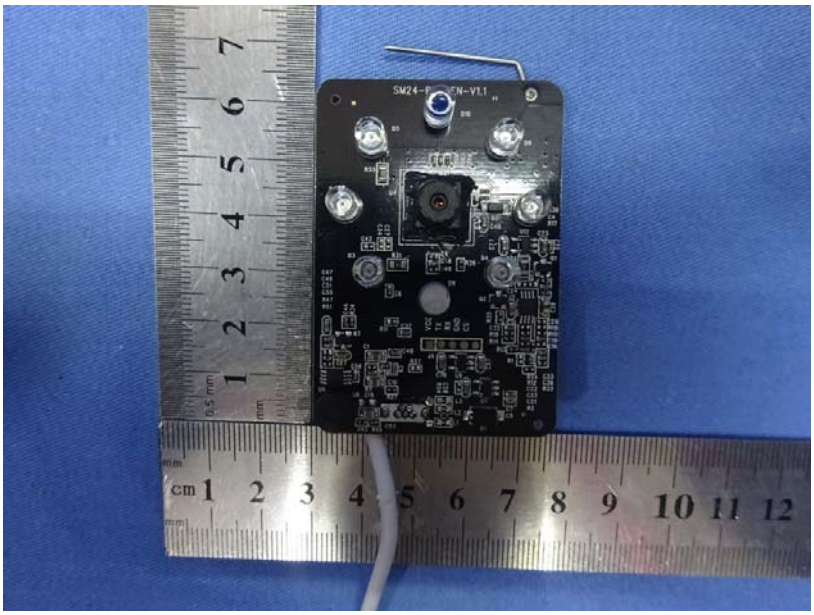
Radiated Emission

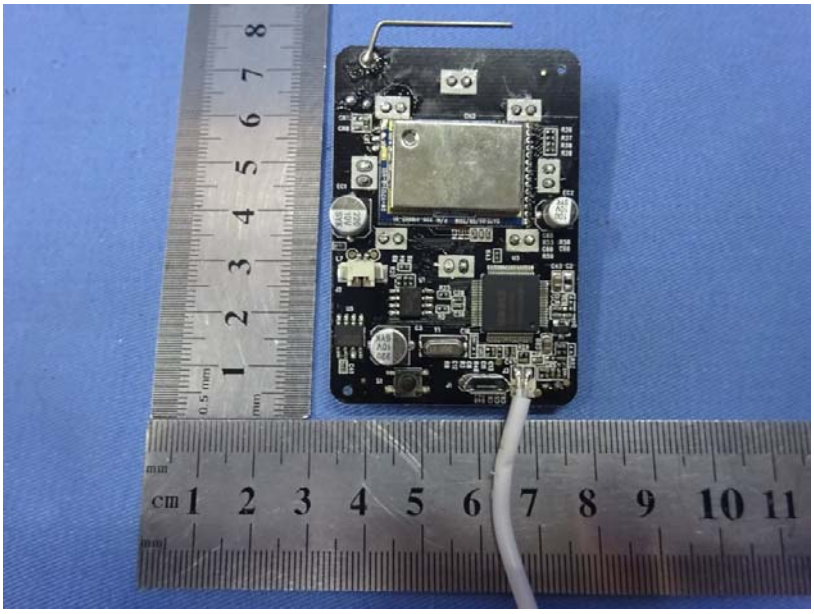


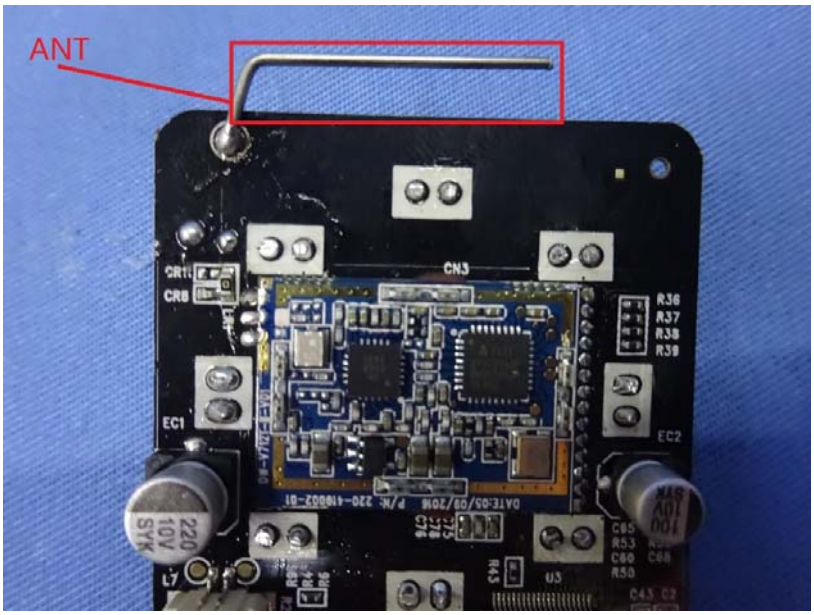


Conducted Emission

9 EUT Constructional Details






ANT
CN3
EC1
EC2
220
10V
SYK

AC ADAPTER 1702
MODEL:K05S050060U
INPUT:100-240V~50/60Hz 0.2A
OUTPUT:5.0V ⎓ 0.6A
I.T.E. power supply
VI
C
US
Intertek
LPS
4006448
MADE IN CHINA
Dongguan Guanjin Electronics Technology Co.,Ltd

ADAPTOR
MODEL:EP19-050060WXLA
INPUT:100-240V ~ 50/60Hz 200mA Max.
OUTPUT: 5.0V ⎓0.6A
I. T. E. POWER SUPPLY
C UL US
Made in China

------End------