



FCC Report

Applicant: ABUS USA LLC

Address of Applicant: 23910 N. 19th Ave., Unit #56, Phoenix, AZ 85085-1850 United States

Equipment Under Test (EUT)

Product Name: Digital Wireless Surveillance System

Model No.: TVAC16000C-Monitor

FCC ID: 2AB47TVAC16000C

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247:2013

Date of sample receipt: March 17, 2014

Date of Test: March 30-April 16, 2014

Date of report issued: April 16, 2014

Test Result : PASS *

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

Authorized Signature:

Robinson Lo

Laboratory Manager

This report details the results of the testing carried out on one sample. The results contained in this test report do not relate to other samples of the same product and does not permit the use of the GTS product certification mark. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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2 Version

Version No.	Date	Description
00	April 16, 2014	Original

Prepared By:



Date:

April 16, 2014

Project Engineer

Check By:



Date:

April 16, 2014

Reviewer

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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.

5 General Information

5.1 Client Information

Applicant:	ABUS USA LLC
Address of Applicant:	23910 N. 19th Ave., Unit #56, Phoenix, AZ 85085-1850 United States
Manufacturer/Factory:	ABUS USA LLC
Address of Manufacturer/ Factory:	23910 N. 19th Ave., Unit #56, Phoenix, AZ 85085-1850 United States

5.2 General Description of EUT

Product Name:	Digital Wireless Surveillance System
Model No.:	TVAC16000C-Monitor
Operation Frequency:	2414.25MHz~2461.5MHz
Channel numbers:	15
Channel separation:	3.375MHz
Modulation type:	GFSK
Antenna Type:	Integral antenna
Antenna gain:	2dBi (declare by Applicant)
Power supply:	Adapter 1: Model No.: KSAS0050500100VUD Input: AC 100-240V, 50/60Hz, 0.18A Output: DC 5V, 1.0A Adapter 2: Model No.: CS6D050100FU Input: AC 100-240V, 50/60Hz, 200mA Output: DC 5V, 1.0A Adapter 3: Model No.: SSA021F050100USD Input: AC 100-240V, 50/60Hz, 0.2A Output: DC 5V, 1.0A
Remark:	All adapter were tested, only the worse adapter's (Adapter 1) data was exhibited in the report.

Operation Frequency each of channel					
Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2414.250MHz	6	2431.125MHz	11	2448.000MHz
2	2417.625MHz	7	2434.500MHz	12	2451.375MHz
3	2421.000MHz	8	2437.875MHz	13	2454.750MHz
4	2424.375MHz	9	2441.250MHz	14	2458.125MHz
5	2427.750MHz	10	2444.625MHz	15	2461.500MHz

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	2414.250MHz
The middle channel	2437.875MHz
The Highest channel	2461.500MHz

5.3 Test mode

Transmitting mode	Keep the EUT in continuously transmitting mode (for Peak power, 20dB Bandwidth, Band edge and Spurious Emissions test)
Hopping on mode	Keep the EUT in hopping on mode (for Frequencies Separation, Hopping channel number, Dwell time test)

5.4 Test Facility

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

- **CNAS —Registration No.: CNAS L5775**

CNAS has accredited Global United Technology Services Co., Ltd. To ISO/IEC 17025 General Requirements for the competence of testing and calibration laboratories (CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence in the field of testing.

- **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 28, 2013.

- **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, June 26, 2013.

5.5 Test Location

All tests were performed at:

Global United Technology Services Co., Ltd.

Address: 2nd Floor, Block No.2, Laodong Industrial Zone, Xixiang Road Baoan District, Shenzhen, China

Tel: 0755-27798480

Fax: 0755-27798960

5.6 Other Information Requested by the Customer

None.

5.7 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	9.2(L)*6.2(W)* 6.4(H)	GTS250	Mar. 28 2014	Mar. 27 2015
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	Dec. 5, 2013	Dec. 4 2014
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jul. 02 2013	Jul. 01 2014
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Jul. 02 2013	Jul. 01 2014
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 28 2013	June 27 2014
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 28 2014	Mar. 27 2015
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 29 2014	Mar. 28 2015
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 29 2014	Mar. 28 2015
11	Coaxial cable	GTS	N/A	GTS210	Mar. 29 2014	Mar. 28 2015
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 29 2014	Mar. 28 2015
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jul. 02 2013	Jul. 01 2014
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jul. 02 2013	Jul. 01 2014
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 28 2013	June 27 2014
16	Band filter	Amindeon	82346	GTS219	Mar. 29 2014	Mar. 28 2015

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	7.0(L)x3.0(W)x3.0(H)	GTS264	Sep. 07 2013	Sep. 06 2015
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jul. 02 2013	Jul. 01 2014
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jul. 02 2013	Jul. 01 2014
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jul. 02 2013	Jul. 01 2014
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jul. 02 2013	Jul. 01 2014
6	Coaxial Cable	GTS	N/A	GTS227	Jul. 02 2013	Jul. 01 2014
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

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	July 09 2013	July 08 2014

7 Test results and Measurement Data

7.1 Antenna requirement

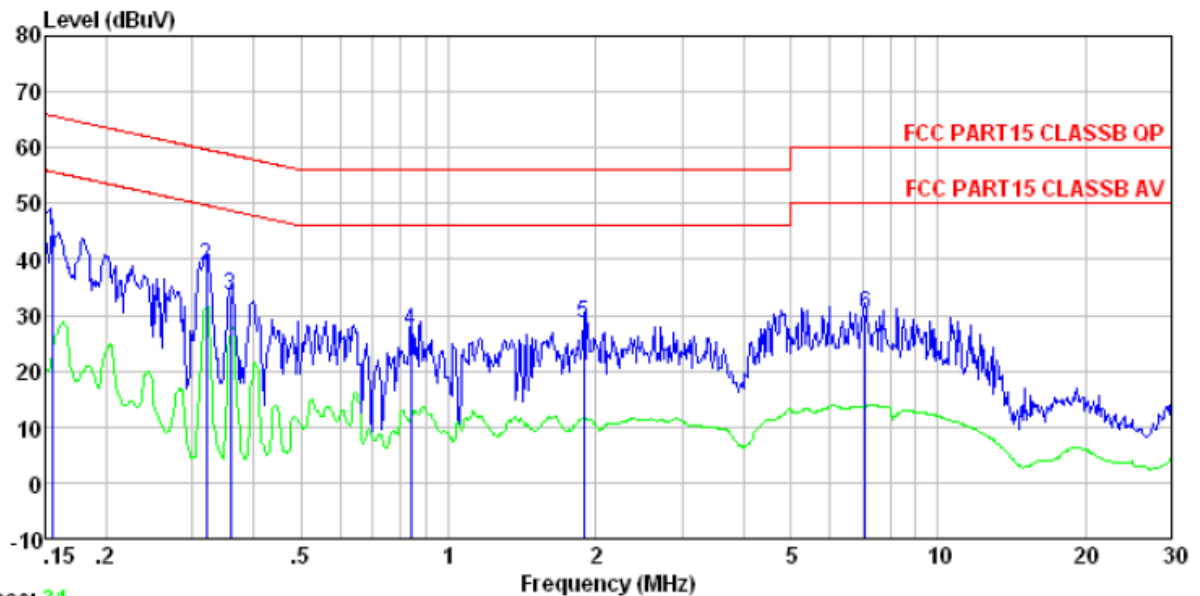
Standard requirement:	FCC Part15 C Section 15.203 /247(c)
<p>15.203 requirement:</p> <p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that 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.</p> <p>15.247(c) (1)(i) requirement:</p> <p>(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.</p>	
E.U.T Antenna:	
<p><i>The antenna is Integral antenna, the best case gain of the antenna is 2dBi</i></p> 	

7.2 Conducted Emissions

Test Requirement:	FCC Part15 C Section 15.207			
Test Method:	ANSI C63.4:2003			
Test Frequency Range:	150KHz to 30MHz			
Class / Severity:	Class B			
Receiver setup:	RBW=9KHz, VBW=30KHz, Sweep time=auto			
Limit:	Frequency range (MHz)	Limit (dBuV)		
		Quasi-peak	Average	
		0.15-0.5	66 to 56*	56 to 46*
		0.5-5	56	46
		5-30	60	50
* Decreases with the logarithm of the frequency.				
Test setup:	<div><p style="text-align: center;">Reference Plane</p><p style="text-align: center;">Test table/Insulation plane</p><p><i>Remark</i> E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</p></div>			
Test procedure:	<div><div>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.</div><div>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).</div><div>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 C63.4: 2003 on conducted measurement.</div></div>			
Test Instruments:	Refer to section 6.0 for details			
Test mode:	Refer to section 5.3 for details			
Test results:	Pass			

Measurement data:

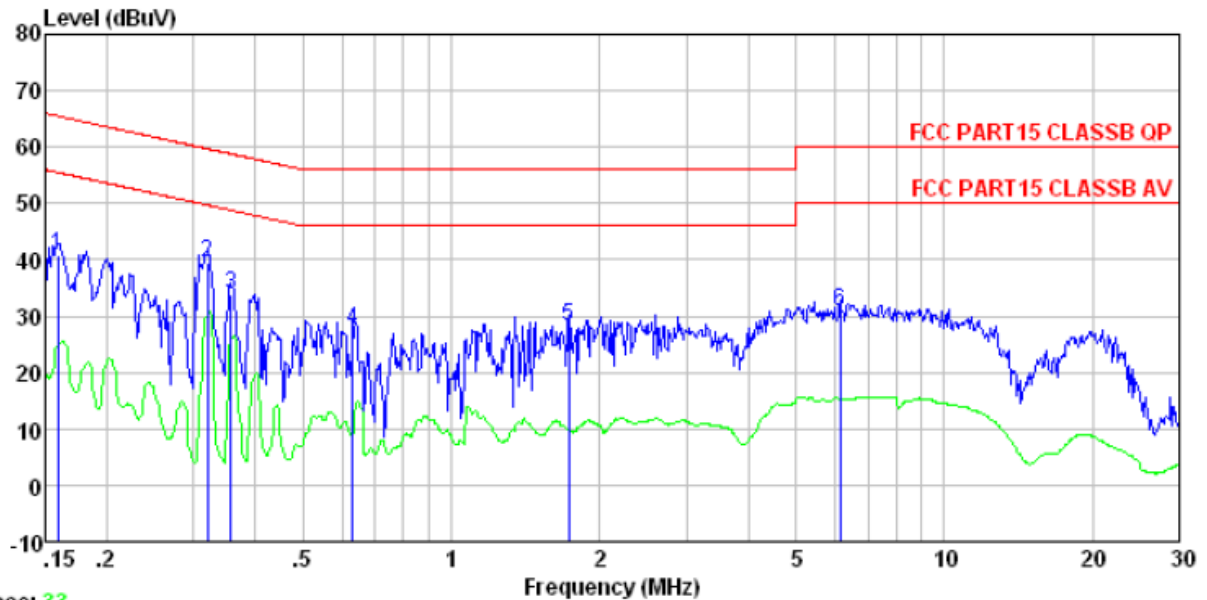
Line:



Condition : FCC PART15 CLASSB QP LISN-2013 LINE
 Job No. : 0341RF
 Test mode : Transmitting mode
 Test Engineer: Liu

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.155	44.75	0.15	0.12	45.02	65.74	-20.72	QP
2	0.320	38.48	0.11	0.10	38.69	59.71	-21.02	QP
3	0.360	33.36	0.11	0.10	33.57	58.74	-25.17	QP
4	0.839	27.04	0.14	0.13	27.31	56.00	-28.69	QP
5	1.888	28.40	0.12	0.14	28.66	56.00	-27.34	QP
6	7.100	29.87	0.25	0.17	30.29	60.00	-29.71	QP

Neutral:



Trace: 33

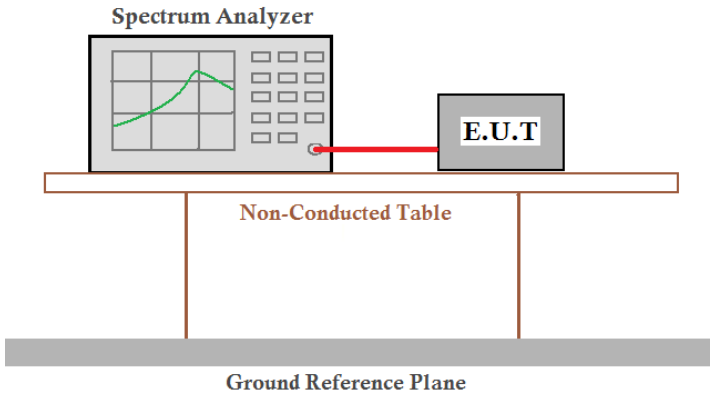
Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
 Job No. : 0341RF
 Test mode : Transmitting mode
 Test Engineer: Liu

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.159	40.75	0.07	0.12	40.94	65.52	-24.58	QP
2	0.320	39.30	0.06	0.10	39.46	59.71	-20.25	QP
3	0.358	33.51	0.06	0.10	33.67	58.78	-25.11	QP
4	0.630	27.31	0.07	0.13	27.51	56.00	-28.49	QP
5	1.734	27.86	0.09	0.14	28.09	56.00	-27.91	QP
6	6.153	30.48	0.17	0.16	30.81	60.00	-29.19	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.

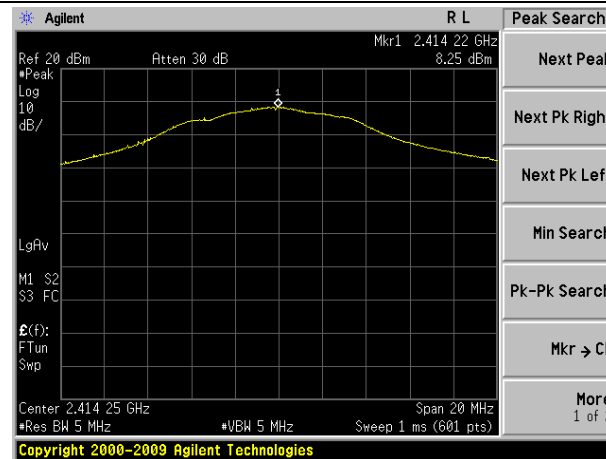
7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.4:2003
Limit:	20.96
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

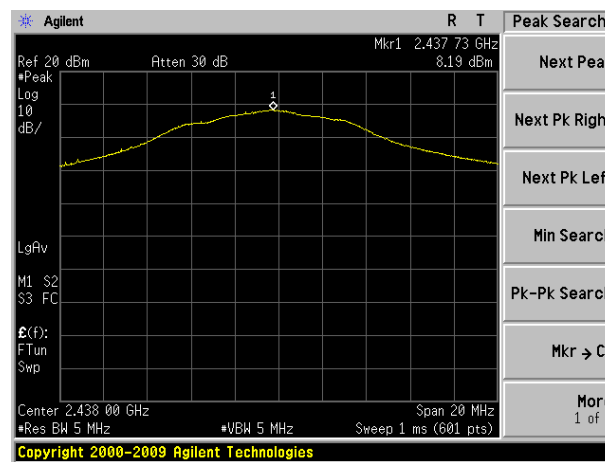
Measurement Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	8.25	20.96	Pass
Middle	8.19		
Highest	8.19		

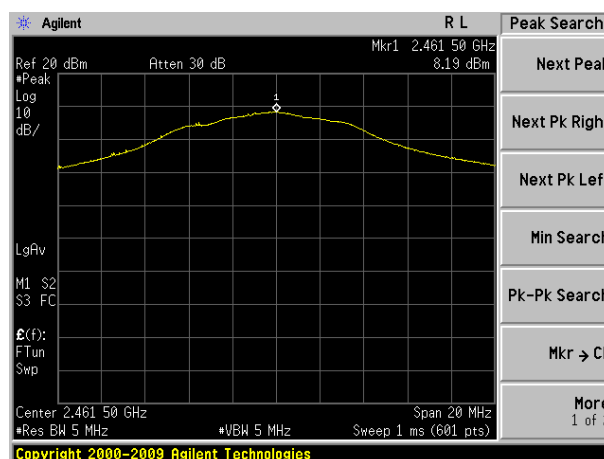
Test plot as follows:



Lowest channel

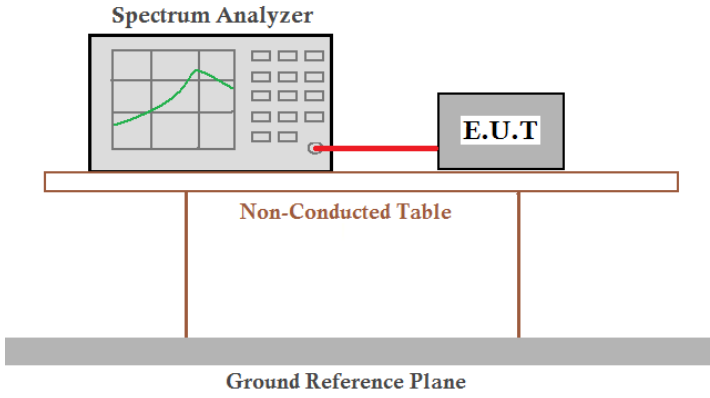


Middle channel



Highest channel

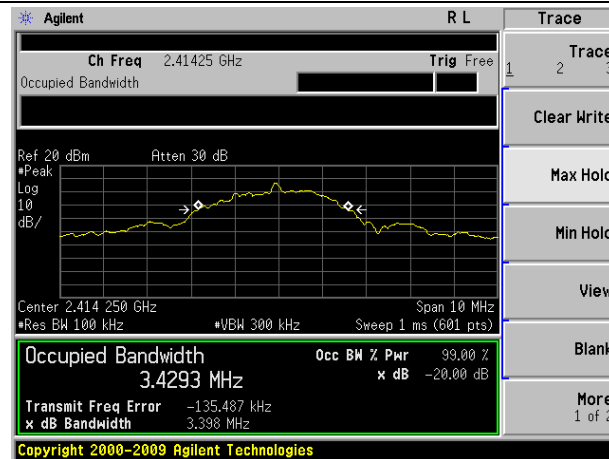
7.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.4:2003
Limit:	N/A
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

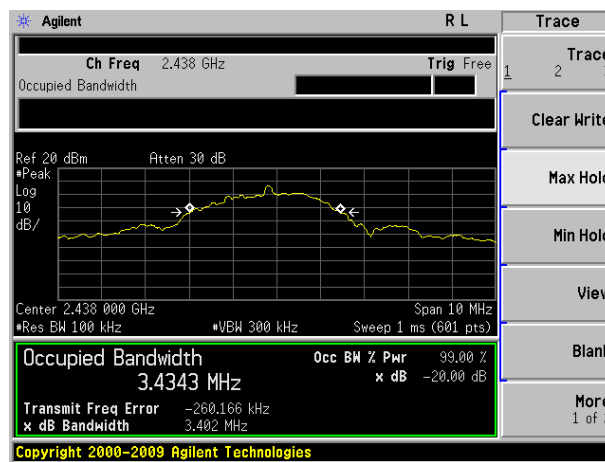
Measurement Data

Test channel	20dB Emission Bandwidth (MHz)	Result
Lowest	3.398	Pass
Middle	3.402	
Highest	3.407	

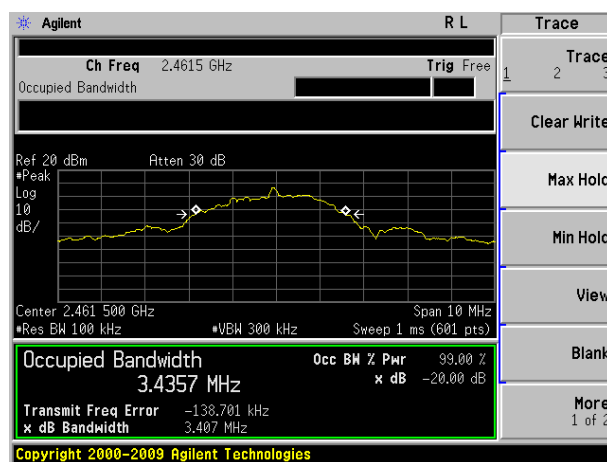
Test plot as follows:



Lowest channel

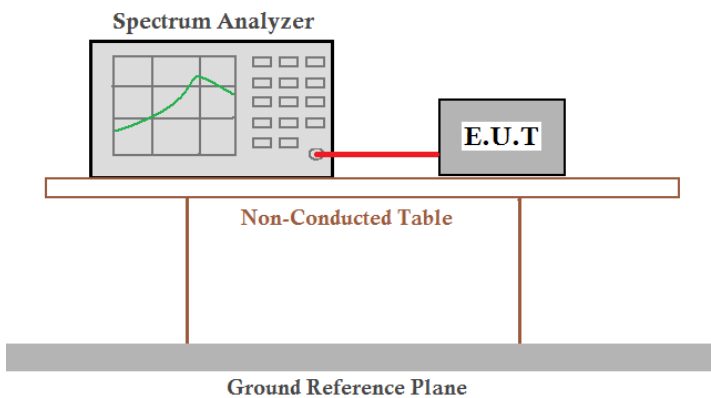


Middle channel



Highest channel

7.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
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 5.3 for details
Test results:	Pass

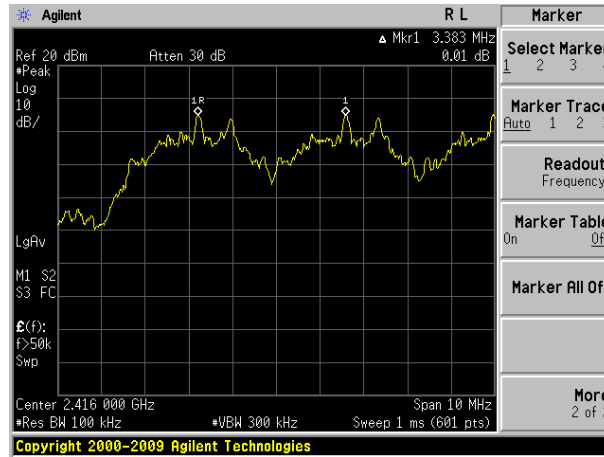
Measurement Data

Test channel	Carrier Frequencies Separation (MHz)	Limit (MHz)	Result
Lowest	3.383	2.27	Pass
Middle	3.367	2.27	Pass
Highest	3.367	2.27	Pass

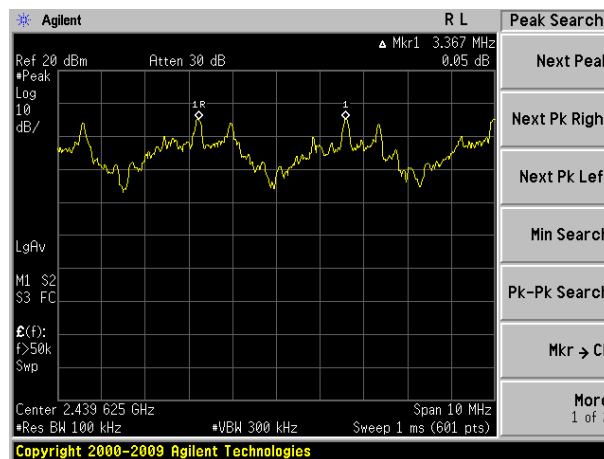
Note: According to section 7.4

20dB bandwidth (MHz) (worse case)	Limit (MHz) (Carrier Frequencies Separation)
3.407	2.27

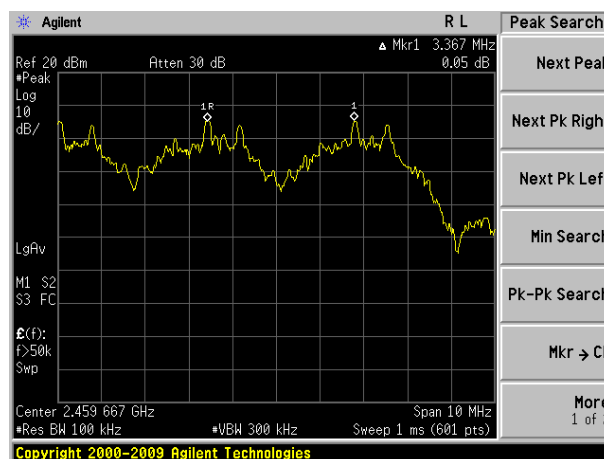
Test plot as follows:



Lowest channel

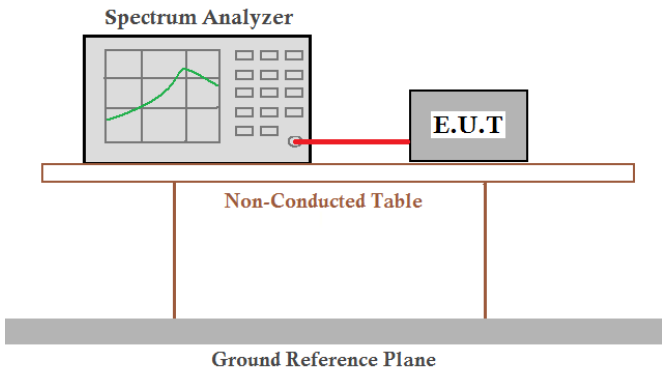


Middle channel



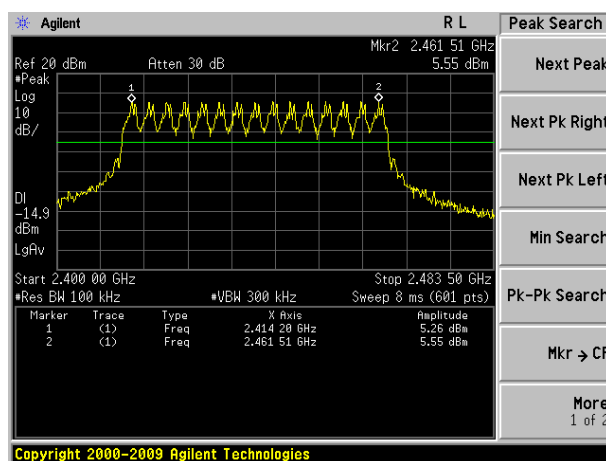
Highest channel

7.6 Hopping Channel Number

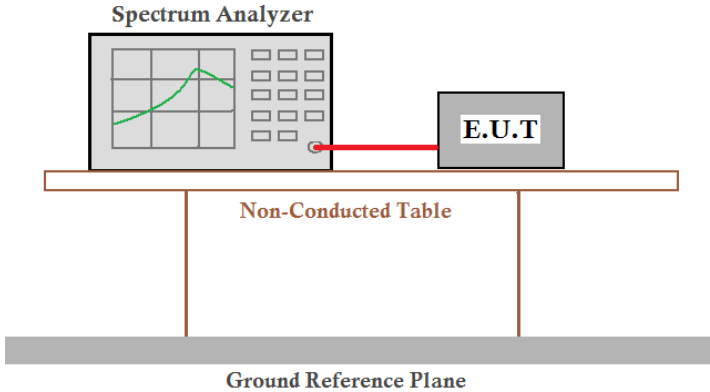
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table. Below the table is a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data:

Hopping channel numbers	Limit	Result
15	15	Pass



7.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
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 5.3 for details
Test results:	Pass

Measurement Data

Frequency	Dwell time(ms)	Limit(ms)	Result
2414.250MHz	312.12	400	Pass
2437.875MHz	397.44	400	Pass
2461.500MHz	276.48	400	Pass

Dwell time = Ton * Np * Test period

Test period: T= 0.4 Second/Channel x 15 Channel = 6 s

Ton: Duration Time of single pulse

Np: Number of the pulse in 1 second

Thus, the Dwell time at each channel is blow:

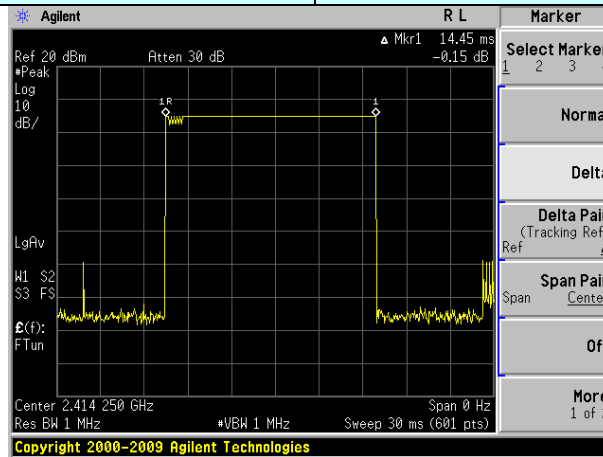
Lowest: $14.45\text{ms} * 18 / 5 * 6 = 312.12\text{ms}$

Middle: $14.4\text{ms} * 23 / 5 * 6 = 397.44\text{ms}$

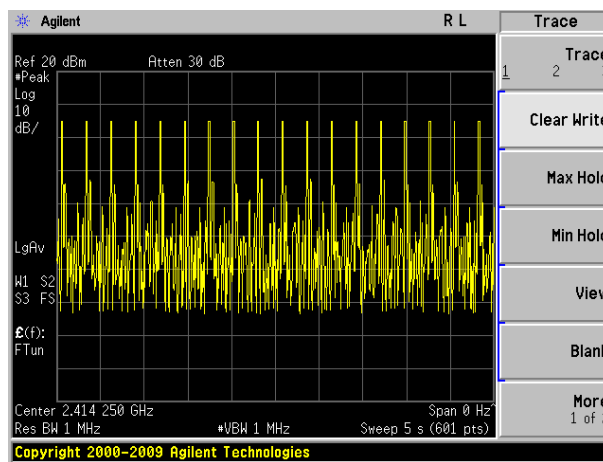
Highest: $12.8\text{ms} * 18 / 5 * 6 = 276.48\text{ms}$

Test plot as follows:

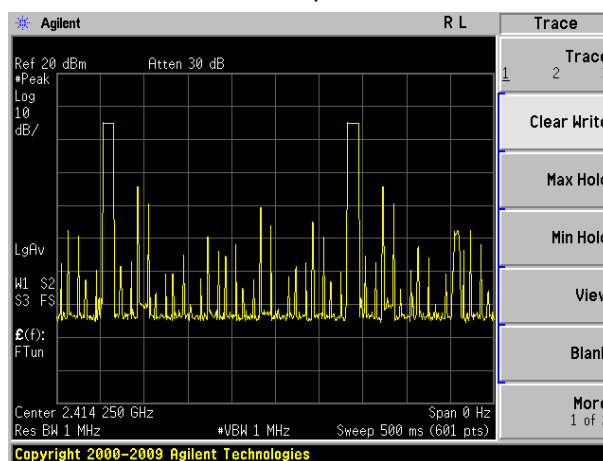
Test Channel:	Lowest Channel
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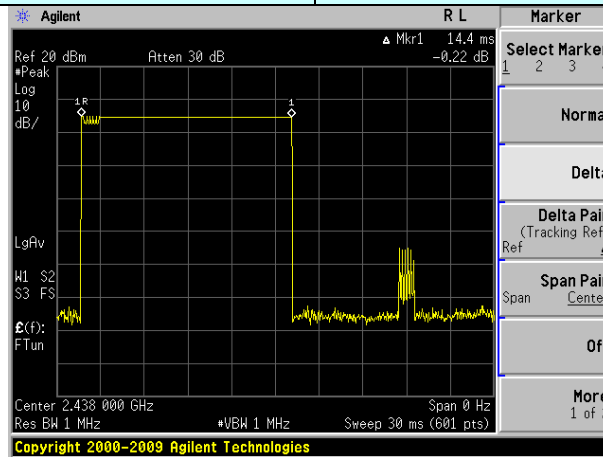
Ton



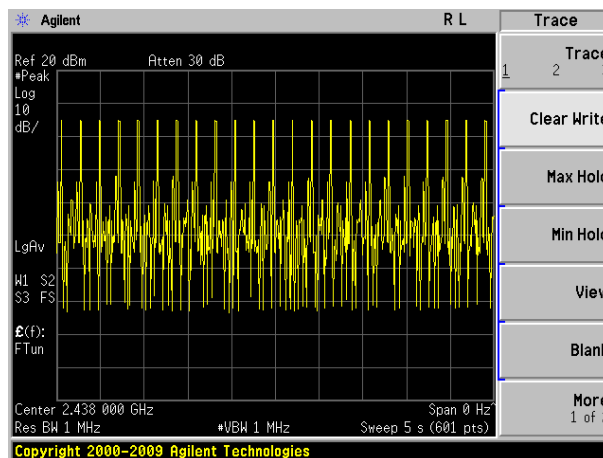
Np



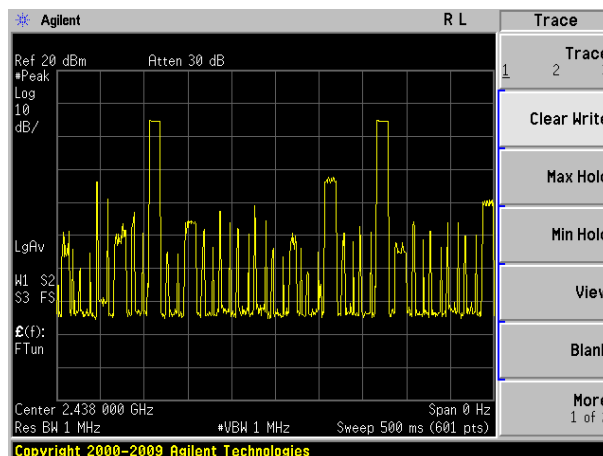
Test Channel:	Middle Channel
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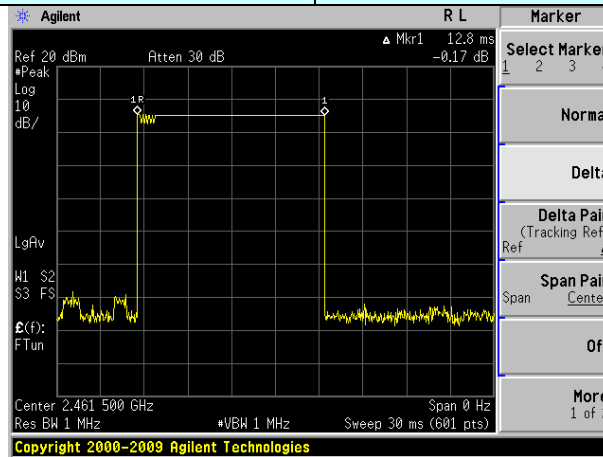
Ton



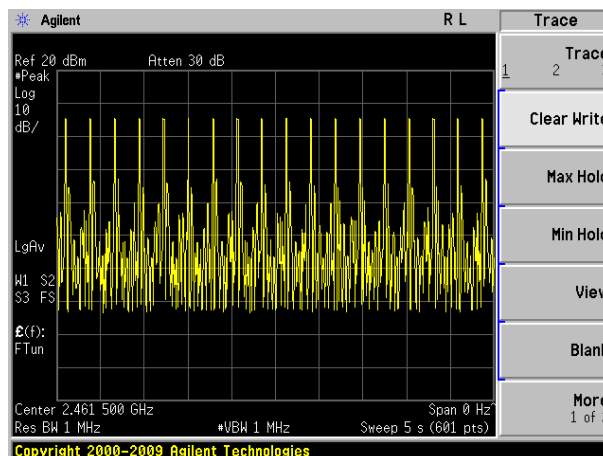
Np



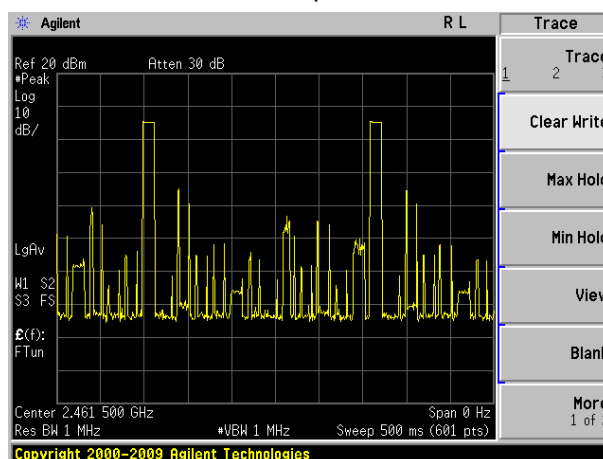
Test Channel:	Highest Channel
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Ton

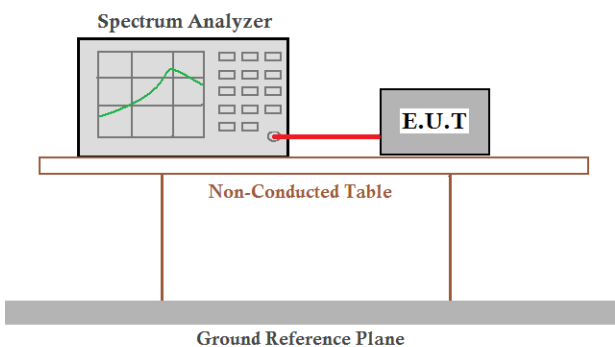


Np

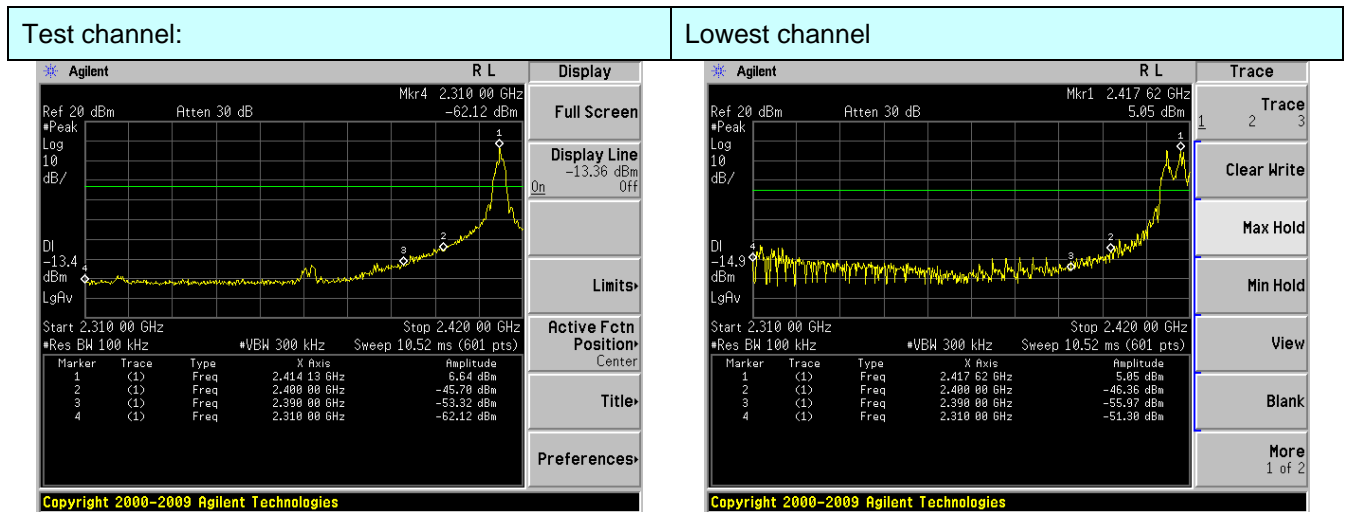


7.8 Band Edge

7.8.1 Conducted Emission Method

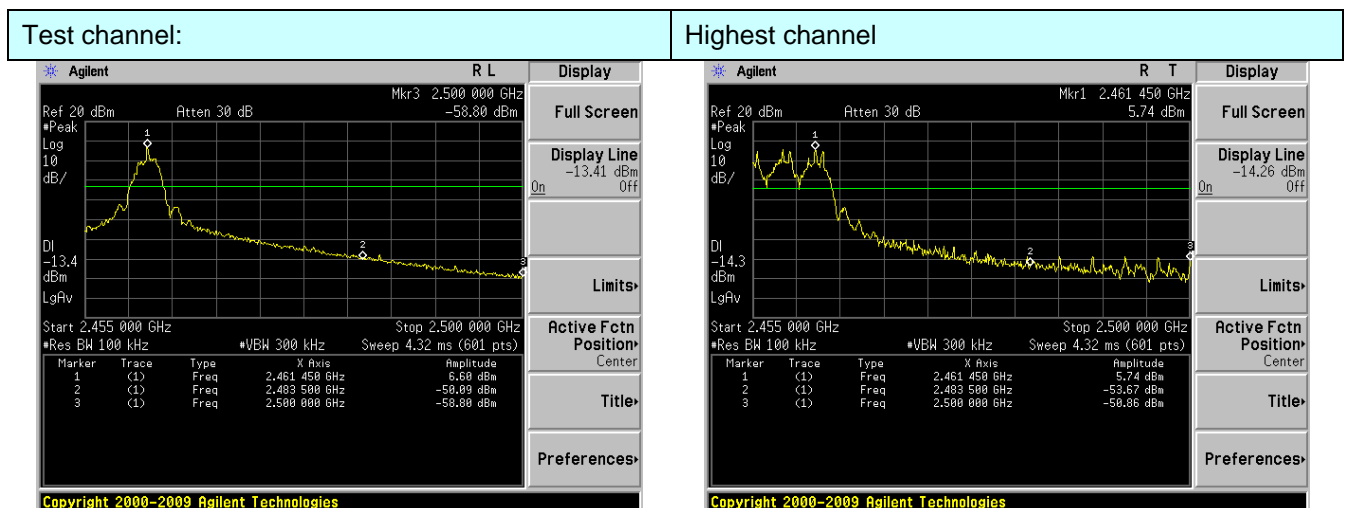
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected to an E.U.T. (Equipment Under Test) via a red cable. Both the Spectrum Analyzer and the E.U.T. are placed on a Non-Conducted Table. The table is supported by a Ground Reference Plane.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Test plot as follows:



No-hopping mode

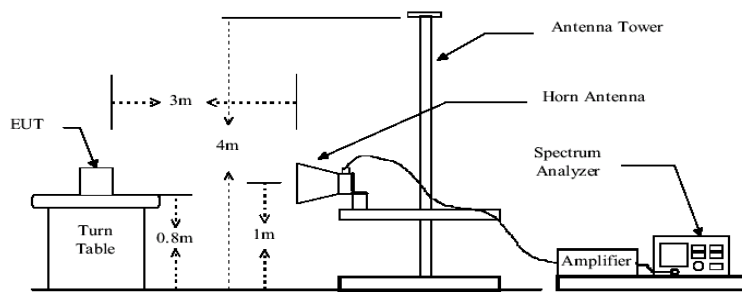
Hopping mode



No-hopping mode

Hopping mode

7.8.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.4: 2003				
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:	<ol style="list-style-type: none">1. The EUT was placed on the top of a rotating table 0.8 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 5.3 for details				
Test results:	Pass				

Remark:

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

Test channel:	Lowest
---------------	--------

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	52.59	27.59	5.38	30.18	55.38	74.00	-18.62	Horizontal
2400.00	61.77	27.58	5.39	30.18	64.56	74.00	-9.44	Horizontal
2390.00	55.15	27.59	5.38	30.18	57.94	74.00	-16.06	Vertical
2400.00	65.88	27.58	5.39	30.18	68.67	74.00	-5.33	Vertical

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	34.22	27.59	5.38	30.18	37.01	54.00	-16.99	Horizontal
2400.00	38.64	27.58	5.39	30.18	41.43	54.00	-12.57	Horizontal
2390.00	36.43	27.59	5.38	30.18	39.22	54.00	-14.78	Vertical
2400.00	42.86	27.58	5.39	30.18	45.65	54.00	-8.35	Vertical

Test channel:	Highest
---------------	---------

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	55.88	27.53	5.47	29.93	58.95	74.00	-15.05	Horizontal
2500.00	44.57	27.55	5.49	29.93	47.68	74.00	-26.32	Horizontal
2483.50	60.63	27.53	5.47	29.93	63.70	74.00	-10.30	Vertical
2500.00	45.95	27.55	5.49	29.93	49.06	74.00	-24.94	Vertical

Average value:

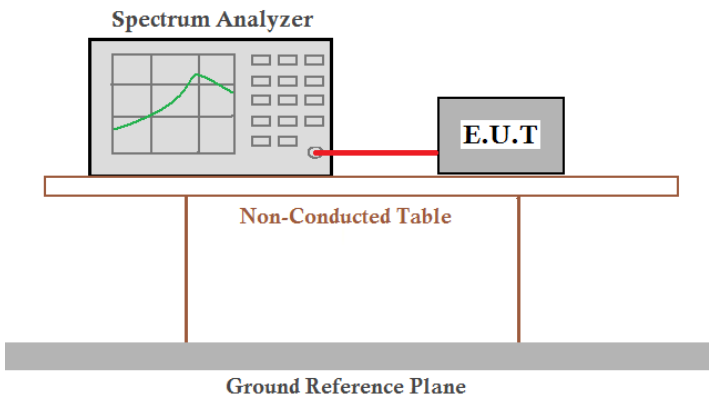
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	35.80	27.53	5.47	29.93	38.87	54.00	-15.13	Horizontal
2500.00	33.55	27.55	5.49	29.93	36.66	54.00	-17.34	Horizontal
2483.50	38.52	27.53	5.47	29.93	41.59	54.00	-12.41	Vertical
2500.00	33.96	27.55	5.49	29.93	37.07	54.00	-16.93	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.

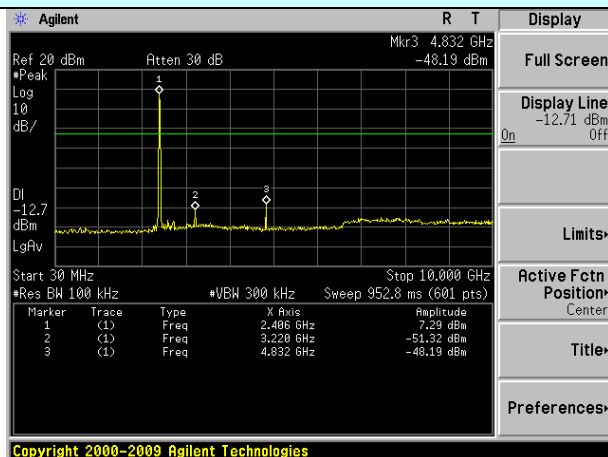
7.9 Spurious Emission

7.9.1 Conducted Emission Method

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and 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:	 <p>The diagram illustrates the test setup for conducted emission measurement. A Spectrum Analyzer is connected via a red cable to an E.U.T. (Equipment Under Test). Both are placed on a Non-Conducted Table, which is supported by two vertical legs. Below the table is a Ground Reference Plane, represented by a thick grey bar.</p>
Test Instruments:	Refer to section 6.0 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

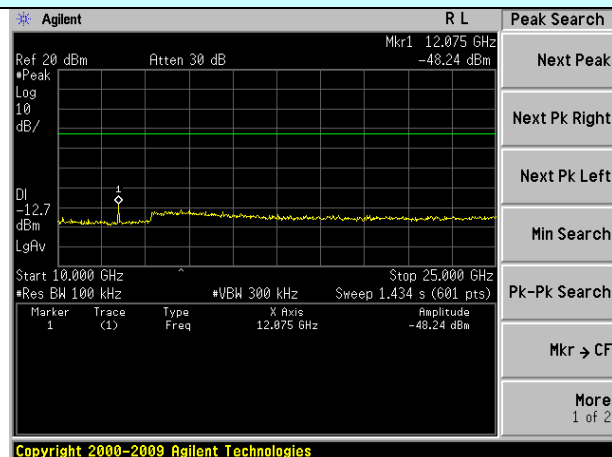
Remark:

Test channel:



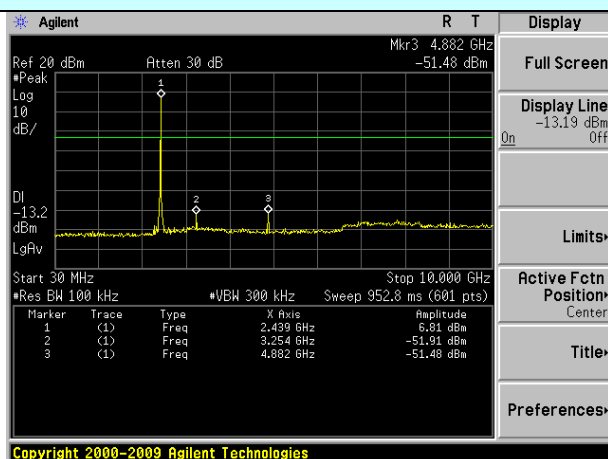
30MHz~10GHz

Lowest channel



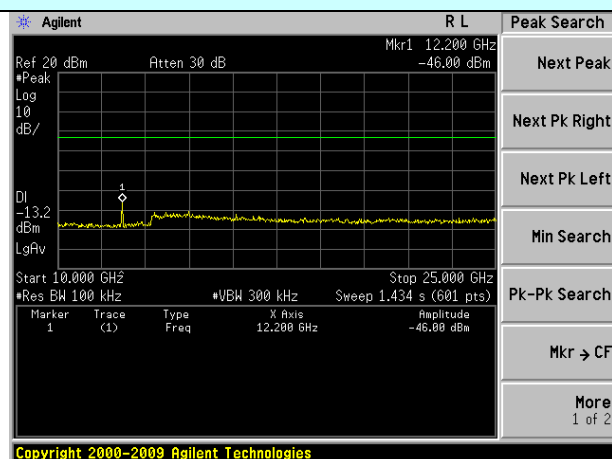
10GHz~25GHz

Test channel:



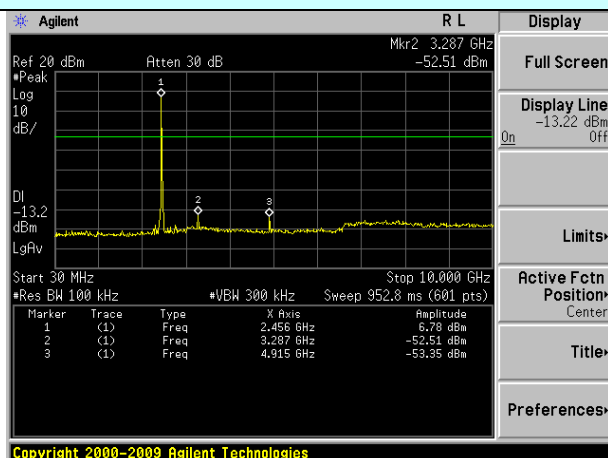
30MHz~10GHz

Middle channel



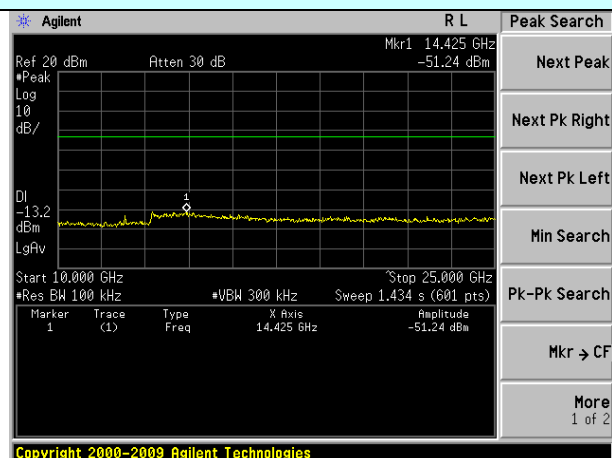
10GHz~25GHz

Test channel:



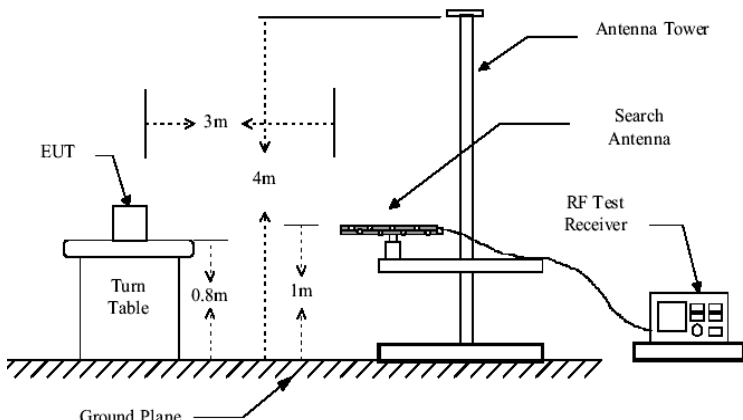
30MHz~10GHz

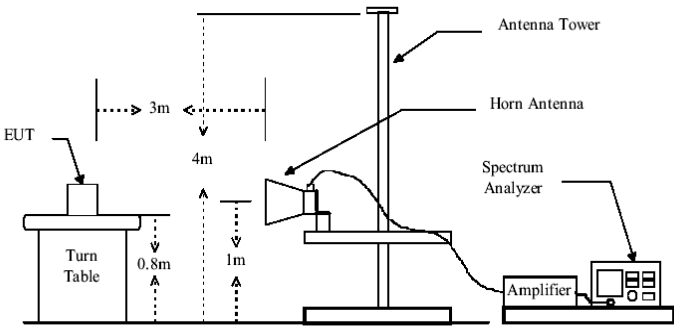
Highest channel



10GHz~25GHz

7.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209				
Test Method:	ANSI C63.4: 2003				
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				
	<div></div>				
	Above 1GHz				

	
<p>Test Procedure:</p>	<ol style="list-style-type: none"> 1. The EUT was placed on the top of a rotating table 0.8 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.
<p>Test Instruments:</p>	<p>Refer to section 6.0 for details</p>
<p>Test mode:</p>	<p>Refer to section 5.3 for details</p>
<p>Test results:</p>	<p>Pass</p>

Remark:

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

Measurement data:

■ **Below 1GHz**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
96.10	55.53	14.90	1.16	31.75	39.84	43.50	-3.66	Vertical
167.82	55.11	10.90	1.67	32.04	35.64	43.50	-7.86	Vertical
191.75	54.82	12.56	1.80	32.12	37.06	43.50	-6.44	Vertical
287.99	54.38	14.84	2.31	32.18	39.35	46.00	-6.65	Vertical
866.09	43.41	22.78	4.73	31.23	39.69	46.00	-6.31	Vertical
962.16	45.29	23.49	5.09	31.22	42.65	54.00	-11.35	Vertical
96.10	47.77	14.90	1.16	31.75	32.08	43.50	-11.42	Horizontal
143.83	53.11	10.22	1.53	31.96	32.90	43.50	-10.60	Horizontal
287.99	53.53	14.84	2.31	32.18	38.50	46.00	-7.50	Horizontal
672.85	45.01	20.72	3.99	31.15	38.57	46.00	-7.43	Horizontal
912.86	45.93	23.18	4.90	31.19	42.82	46.00	-3.18	Horizontal
962.16	46.34	23.49	5.09	31.22	43.70	54.00	-10.30	Horizontal

■ Above 1GHz

Test channel:	Lowest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4828.50	41.15	31.79	8.62	32.10	49.46	74.00	-24.54	Vertical
7242.75	30.06	36.24	11.68	31.97	46.01	74.00	-27.99	Vertical
9657.00	28.25	38.07	14.18	31.56	48.94	74.00	-25.06	Vertical
12071.25	*					74.00		Vertical
14485.50	*					74.00		Vertical
4828.50	32.32	31.79	8.62	32.10	40.63	74.00	-33.37	Horizontal
7242.75	30.86	36.24	11.68	31.97	46.81	74.00	-27.19	Horizontal
9657.00	27.75	38.07	14.18	31.56	48.44	74.00	-25.56	Horizontal
12071.25	*					74.00		Horizontal
14485.50	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4828.50	30.40	31.79	8.62	32.10	38.71	54.00	-15.29	Vertical
7242.75	18.92	36.24	11.68	31.97	34.87	54.00	-19.13	Vertical
9657.00	17.25	38.07	14.18	31.56	37.94	54.00	-16.06	Vertical
12071.25	*					54.00		Vertical
14485.50	*					54.00		Vertical
4828.50	21.25	31.79	8.62	32.10	29.56	54.00	-24.44	Horizontal
7242.75	20.62	36.24	11.68	31.97	36.57	54.00	-17.43	Horizontal
9657.00	18.32	38.07	14.18	31.56	39.01	54.00	-14.99	Horizontal
12071.25	*					54.00		Horizontal
14485.50	*					54.00		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.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test channel:	Middle
---------------	--------

Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4875.75	40.30	31.85	8.66	32.12	48.69	74.00	-25.31	Vertical
7313.63	29.50	36.37	11.72	31.89	45.70	74.00	-28.30	Vertical
9751.50	27.75	38.27	14.25	31.59	48.68	74.00	-25.32	Vertical
12189.38	*					74.00		Vertical
14627.25	*					74.00		Vertical
4875.75	31.30	31.85	8.66	32.12	39.69	74.00	-34.31	Horizontal
7313.63	30.22	36.37	11.72	31.89	46.42	74.00	-27.58	Horizontal
9751.50	27.17	38.27	14.25	31.59	48.10	74.00	-25.90	Horizontal
12189.38	*					74.00		Horizontal
14627.25	*					74.00		Horizontal

Average value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4875.75	30.18	31.85	8.66	32.12	38.57	54.00	-15.43	Vertical
7313.63	18.77	36.37	11.72	31.89	34.97	54.00	-19.03	Vertical
9751.50	17.11	38.27	14.25	31.59	38.04	54.00	-15.96	Vertical
12189.38	*					54.00		Vertical
14627.25	*					54.00		Vertical
4875.75	21.00	31.85	8.66	32.12	29.39	54.00	-24.61	Horizontal
7313.63	20.45	36.37	11.72	31.89	36.65	54.00	-17.35	Horizontal
9751.50	18.16	38.27	14.25	31.59	39.09	54.00	-14.91	Horizontal
12189.38	*					54.00		Horizontal
14627.25	*					54.00		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.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

Test channel:	Highest
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Peak value:

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4923.00	40.11	31.89	8.70	32.15	48.55	74.00	-25.45	Vertical
7384.50	29.37	36.49	11.76	31.84	45.78	74.00	-28.22	Vertical
9846.00	27.63	38.62	14.31	31.74	48.82	74.00	-25.18	Vertical
12307.50	*					74.00		Vertical
14769.00	*					74.00		Vertical
4923.00	31.07	31.89	8.70	32.15	39.51	74.00	-34.49	Horizontal
7384.50	30.08	36.49	11.76	31.84	46.49	74.00	-27.51	Horizontal
9846.00	27.04	38.62	14.31	31.74	48.23	74.00	-25.77	Horizontal
12307.50	*					74.00		Horizontal
14769.00	*					74.00		Horizontal

Average value:

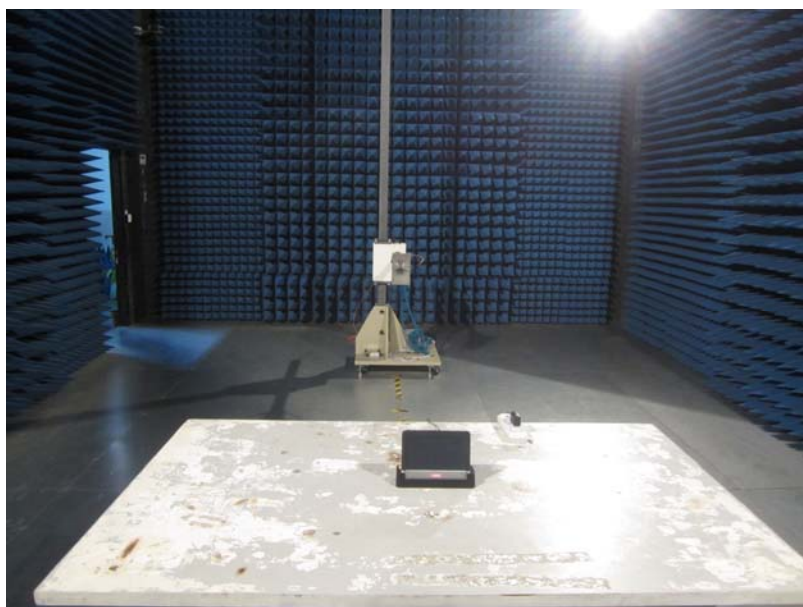
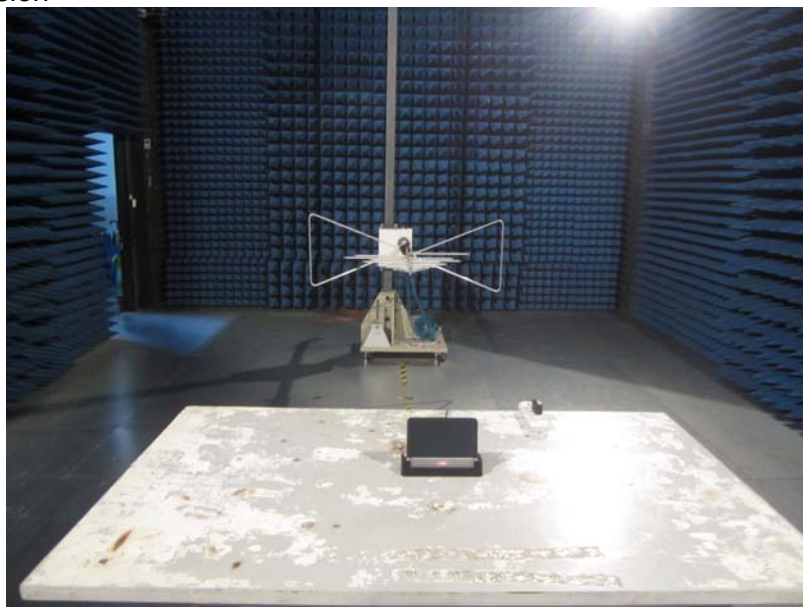
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4923.00	29.99	31.89	8.70	32.15	38.43	54.00	-15.57	Vertical
7384.50	18.64	36.49	11.76	31.84	35.05	54.00	-18.95	Vertical
9846.00	17.00	38.62	14.31	31.74	38.19	54.00	-15.81	Vertical
12307.50	*					54.00		Vertical
14769.00	*					54.00		Vertical
4923.00	20.79	31.89	8.70	32.15	29.23	54.00	-24.77	Horizontal
7384.50	20.31	36.49	11.76	31.84	36.72	54.00	-17.28	Horizontal
9846.00	18.03	38.62	14.31	31.74	39.22	54.00	-14.78	Horizontal
12307.50	*					54.00		Horizontal
14769.00	*					54.00		Horizontal

Remark:

1. Final Level = Receiver Read level + Antenna Factor + Cable Loss – Preamplifier Factor
2. “*”, means this data is too weak instrument of signal is unable to test.
3. The emission levels of other frequencies are very lower than the limit and not show in test report.

8 Test Setup Photo

Radiated Emission



Conducted Emission



9 EUT Constructional Details

Adapter1



Adapter2

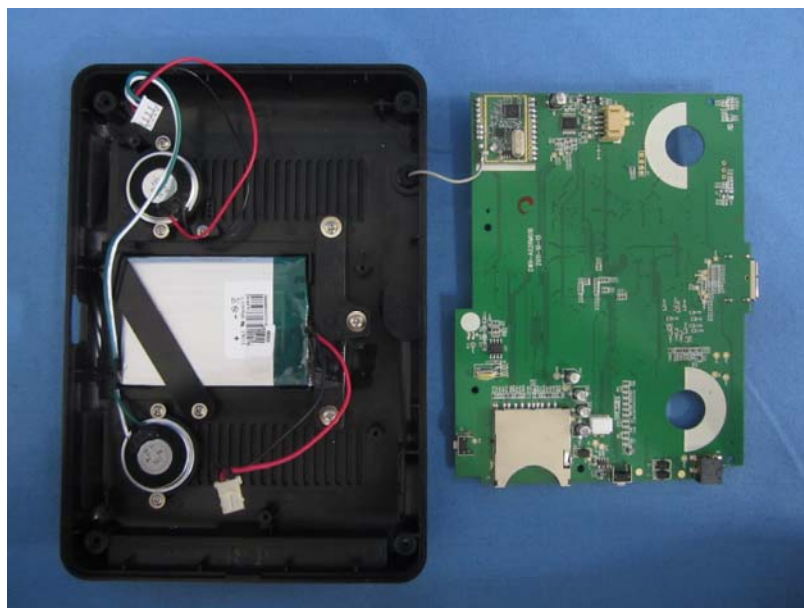


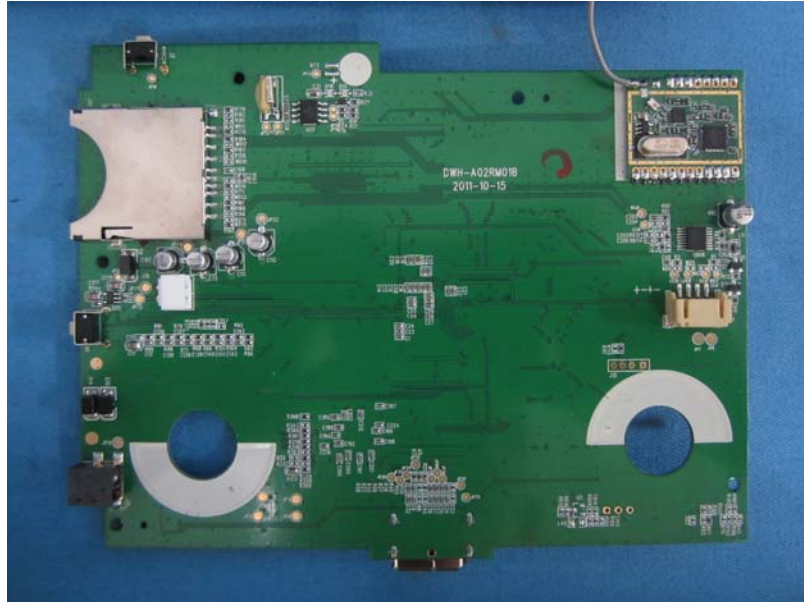
Adapter3













Adapter1



Adapter2



Adapter3



-----end-----