

FCC Report

Applicant: REALTRACE

Address of Applicant: 2, rue Georges Pompidou, 91140 VILLEBON SUR YVETTE.
FRANCE

Equipment Under Test (EUT)

Product Name: UHF RFID READER

Model No.: V10 UHF

Trade Mark: WIDETRACE/REALTRACE

FCC ID: BSO-V10

Applicable standards: FCC CFR Title 47 Part 15 Subpart C Section 15.247:2015

Date of sample receipt: April 05, 2016

Date of Test: April 05-07, 2016

Date of report issued: April 08, 2016

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 08, 2016	Original

Prepared By:

Edward. Pan

Date:

April 08, 2016

Project Engineer

Check By:

Hank. Yan

Date:

April 08, 2016

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	N/A
Conducted Peak Output Power	15.247 (b)(2)	Pass
20dB Occupied Bandwidth	15.247 (a)(i)	Pass
Carrier Frequencies Separation	15.247 (a)(1)	Pass
Hopping Channel Number	15.247 (a)(i)	Pass
Dwell Time	15.247 (a)(i)	Pass
Pseudorandom Frequency Hopping Sequence	15.247(b)(2)	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.

N/A : Not applicable

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

4.1 Measurement Uncertainty

Test Item	Frequency Range	Measurement Uncertainty	Notes
Radiated Emission	9kHz ~ 30MHz	$\pm 4.34\text{dB}$	(1)
Radiated Emission	30MHz ~ 1000MHz	$\pm 4.24\text{dB}$	(1)
Radiated Emission	1GHz ~ 26.5GHz	$\pm 4.68\text{dB}$	(1)
AC Power Line Conducted Emission	0.15MHz ~ 30MHz	$\pm 3.45\text{dB}$	(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 Client Information

Applicant:	REALTRACE
Address of Applicant:	2, rue Georges Pompidou, 91140 VILLEBON SUR YVETTE. FRANCE
Manufacturer:	SHENZHEN MARKTRACE CO.,LTD
Address of Manufacturer:	F3, Blog, D, Changyuan New Material Port, Keyuan Rd, Science&Industry Park, Nanshan District, Shenzhen, 518057, P.R.CHINA

5.2 General Description of EUT

Product Name:	UHF RFID READER
Model No.:	V10 UHF
Operation Frequency:	902.75MHz~927.25MHz
Channel numbers:	50
Channel separation:	500KHz
Modulation type:	GFSK
Antenna Type:	PCB antenna
Antenna gain:	2dBi (declare by Applicant)
Power supply:	DC5V Or DC 3.7V 1500mAh Li-ion Battery

Frequency List:							
Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)	Channel	Frequency (MHz)
1	902.75	14	909.25	27	915.75	40	922.25
2	903.25	15	909.75	28	916.25	41	922.75
3	903.75	16	910.25	29	916.75	42	923.25
4	904.25	17	910.75	30	917.25	43	923.75
5	904.75	18	911.25	31	917.75	44	924.25
6	905.25	19	911.75	32	918.25	45	924.75
7	905.75	20	912.25	33	918.75	46	925.25
8	906.25	21	912.75	34	919.25	47	925.75
9	906.75	22	913.25	35	919.75	48	926.25
10	907.25	23	913.75	36	920.25	49	926.75
11	907.75	24	914.25	37	920.75	50	927.25
12	908.25	25	914.75	38	921.25		
13	908.75	26	915.25	39	921.75		

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	902.75MHz
The middle channel	914.75MHz
The Highest channel	927.25MHz

5.3 Test mode

Transmitting mode	Keep continuously transmitting mode
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5.4 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 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: 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

5.6 Other Information Requested by the Customer

None.

5.7 Description of Support Units

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
Emerson Network Power	USB Charger	A1299	N/A	VOC

6 Test Instruments list

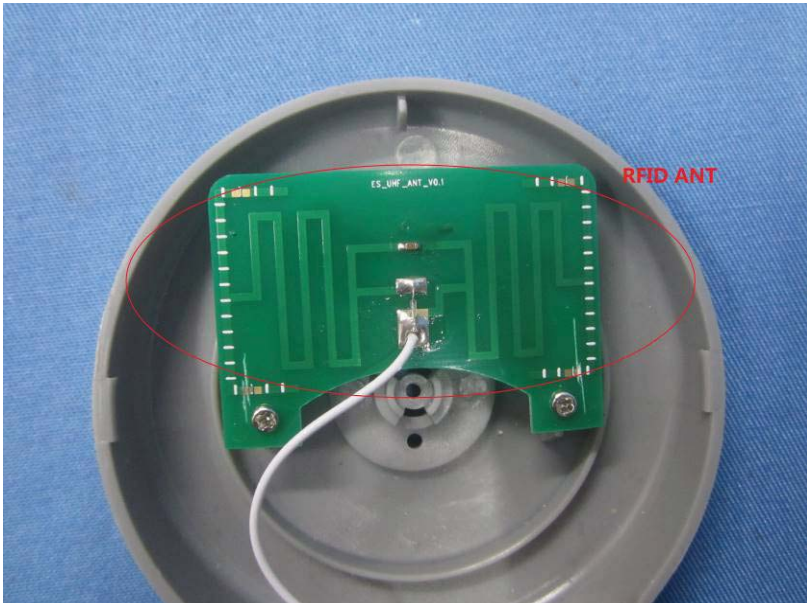
Radiated Emission:						
Item	Test Equipment	Manufacturer	Model No.	Inventory No.	Cal.Date (mm-dd-yy)	Cal.Due date (mm-dd-yy)
1	3m Semi- Anechoic Chamber	ZhongYu Electron	9.0(L)*6.0(W)* 6.0(H)	GTS250	July. 03 2015	July. 02 2020
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	Spectrum Analyzer	Agilent	E4440A	GTS533	Jun. 30 2015	Jun. 29 2016
4	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jun. 30 2015	Jun. 29 2016
5	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Jun. 30 2015	Jun. 29 2016
6	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	Jun. 26 2015	Jun. 25 2016
7	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 26 2016	Mar. 25 2017
8	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
9	Coaxial Cable	GTS	N/A	GTS213	Mar. 27 2016	Mar. 26 2017
10	Coaxial Cable	GTS	N/A	GTS211	Mar. 27 2016	Mar. 26 2017
11	Coaxial cable	GTS	N/A	GTS210	Mar. 27 2016	Mar. 26 2017
12	Coaxial Cable	GTS	N/A	GTS212	Mar. 27 2016	Mar. 26 2017
13	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jun. 30 2015	Jun. 29 2016
14	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jun. 30 2015	Jun. 29 2016
15	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	Jun. 26 2015	Jun. 25 2016
16	Band filter	Amindeon	82346	GTS219	Mar. 27 2016	Mar. 26 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	7.0(L)x3.0(W)x3.0(H)	GTS264	Jun. 30 2015	Jun. 29 2016
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jun. 30 2015	Jun. 29 2016
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jun. 30 2015	Jun. 29 2016
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jun. 30 2015	Jun. 29 2016
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jun. 30 2015	Jun. 29 2016
6	Coaxial Cable	GTS	N/A	GTS227	Jun. 30 2015	Jun. 29 2016
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 07 2015	July 06 2016

7 Test results and Measurement Data

7.1 Antenna requirement

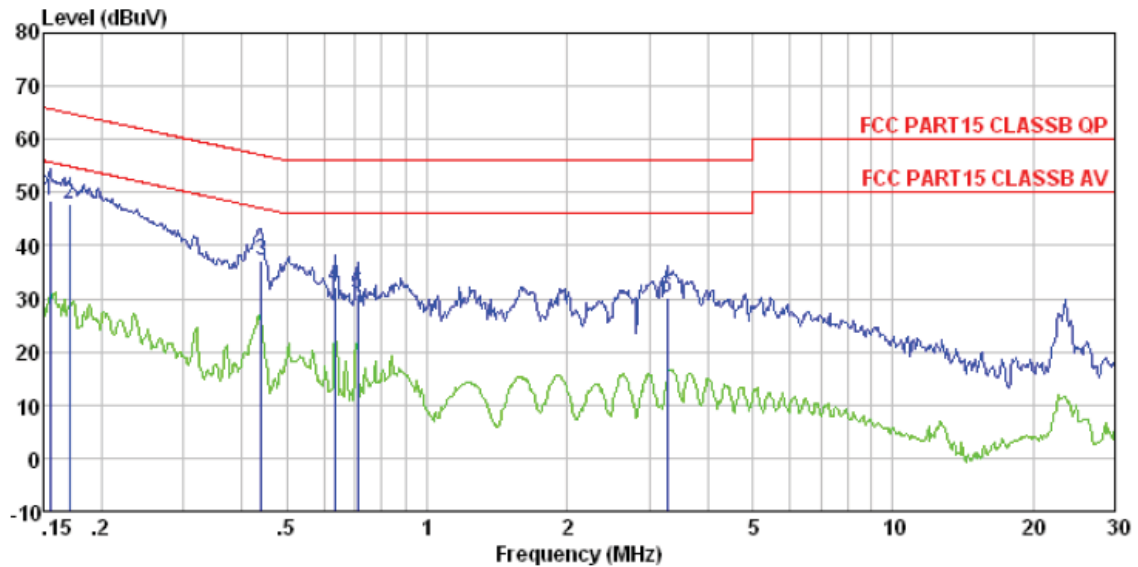
Standard requirement:	FCC Part15 C Section 15.203 /247(c)
15.203 requirement: An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique 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.	
EUT Antenna:	
<p><i>The antenna is PCB 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 C63.10:2013		
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: E.U.T: Equipment Under Test LISN: Line Impedance Stabilization Network Test table height=0.8m</i></p></div>		
Test procedure:	<div><ol style="list-style-type: none">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.</div>		
Test Instruments:	Refer to section 6.0 for details		
Test mode:	Refer to section 5.3 for details		
Test results:	Pass		

Measurement data:

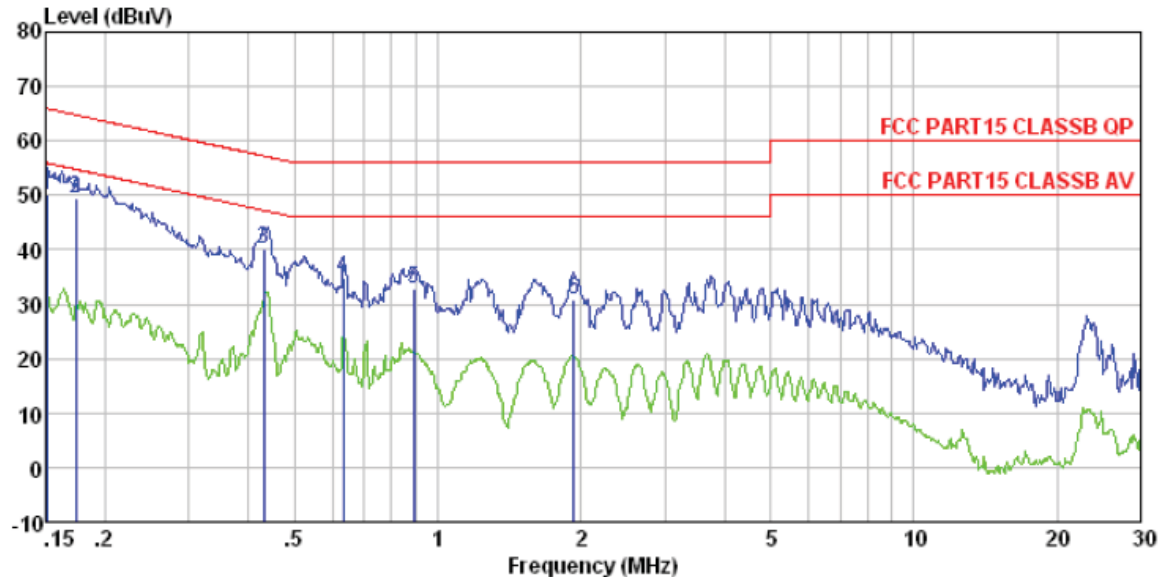
Line:



Condition : FCC PART15 CLASSB QP LISN-2013 LINE
 Job No. : 2200RF
 Test mode : Transmitting mode
 Test Engineer: Rong

	Freq	Read Level	LISN Level	LISN Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.155	48.06	48.33	0.15	0.12	65.74	-17.41	QP
2	0.170	47.42	47.69	0.15	0.12	64.94	-17.25	QP
3	0.440	37.00	37.23	0.12	0.11	57.07	-19.84	QP
4	0.634	31.87	32.13	0.13	0.13	56.00	-23.87	QP
5	0.708	30.54	30.81	0.14	0.13	56.00	-25.19	QP
6	3.276	29.76	30.08	0.17	0.15	56.00	-25.92	QP

Neutral:



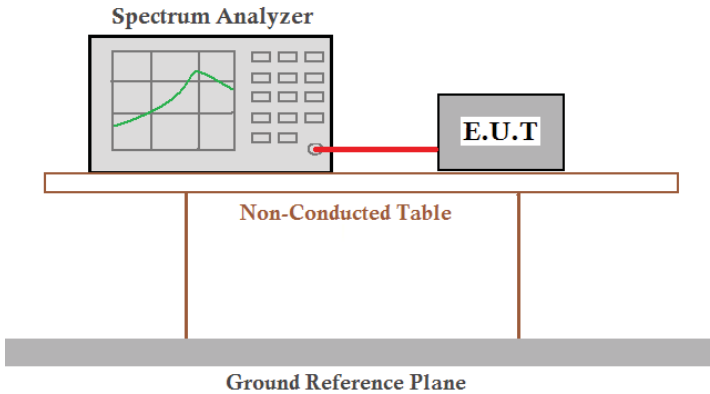
Condition : FCC PART15 CLASSB QP LISN-2013 NEUTRAL
 Job No. : 2200RF
 Test mode : Transmitting mode
 Test Engineer: Rong

	Freq	Read Level	LISN Level	Factor	Cable Loss	Limit Line	Over Limit	Remark
	MHz	dBuV	dBuV	dB	dB	dBuV	dB	
1	0.152	49.77	49.96	0.07	0.12	65.91	-15.95	QP
2	0.174	49.16	49.36	0.07	0.13	64.77	-15.41	QP
3	0.431	39.94	40.11	0.06	0.11	57.24	-17.13	QP
4	0.634	34.51	34.71	0.07	0.13	56.00	-21.29	QP
5	0.890	32.62	32.82	0.07	0.13	56.00	-23.18	QP
6	1.928	30.58	30.81	0.09	0.14	56.00	-25.19	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

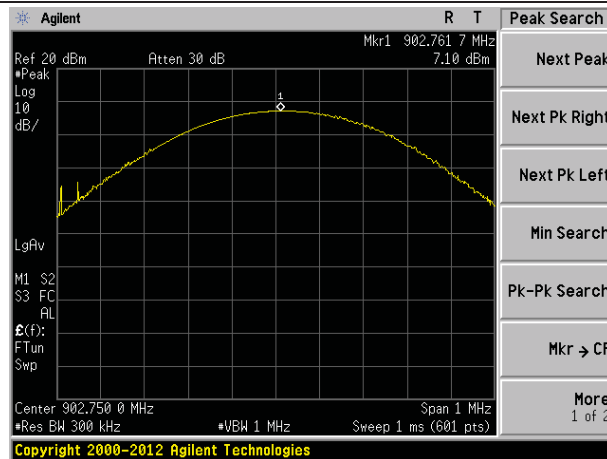
7.3 Conducted Peak Output Power

Test Requirement:	FCC Part15 C Section 15.247 (b)(2)
Test Method:	ANSI C63.10:2013
Limit:	30dBm
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

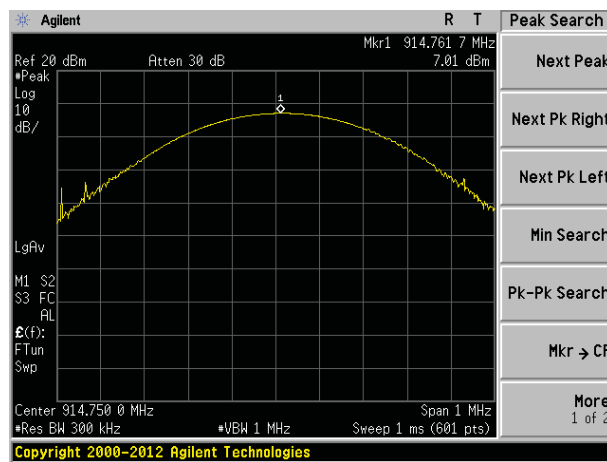
Measurement Data

Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	7.10	30.00	Pass
Middle	7.08		
Highest	6.98		

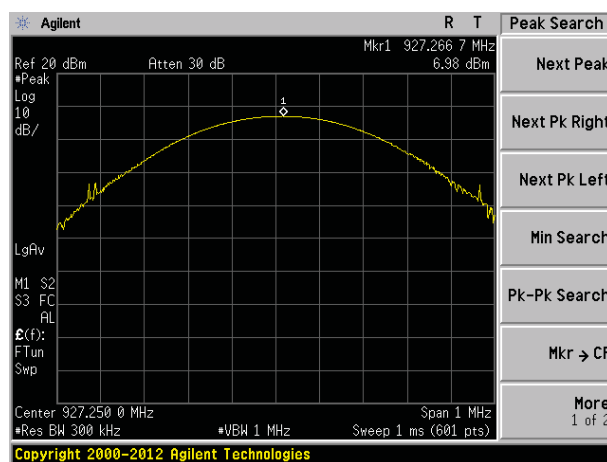
Test plot as follows:



Lowest channel

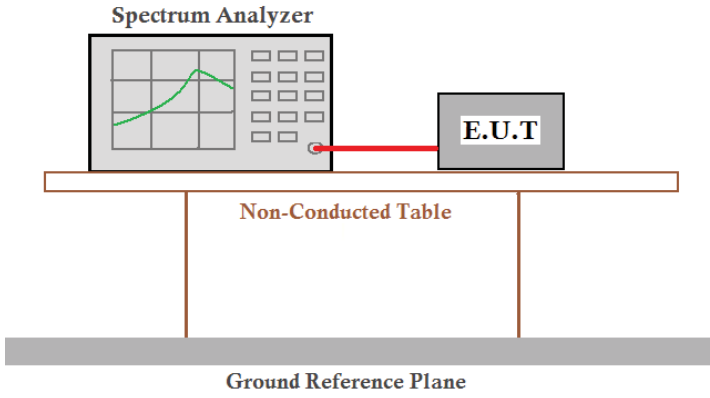


Middle channel



Highest channel

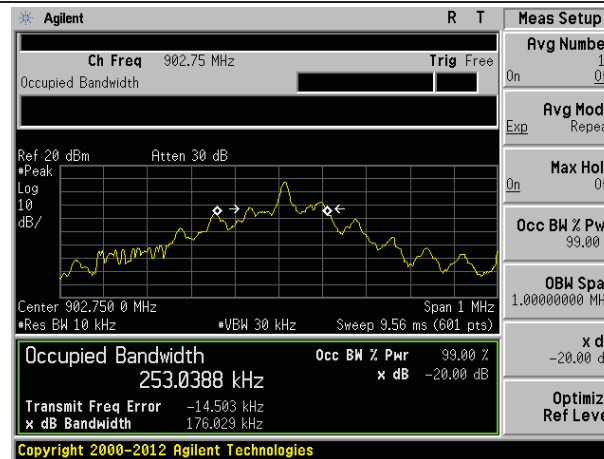
7.4 20dB Emission Bandwidth

Test Requirement:	FCC Part15 C Section 15.247 (a)(i)
Test Method:	ANSI C63.10:2013
Limit:	less than or equal to 500KHz
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

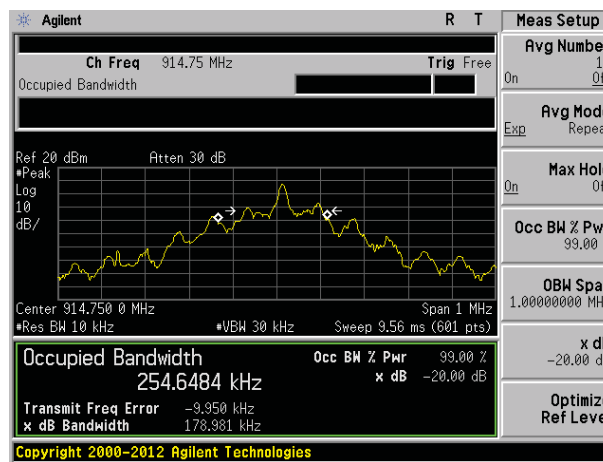
Measurement Data

Test channel	20dB Emission Bandwidth (KHz)	Result
Lowest	176.029	Pass
Middle	178.981	
Highest	179.791	

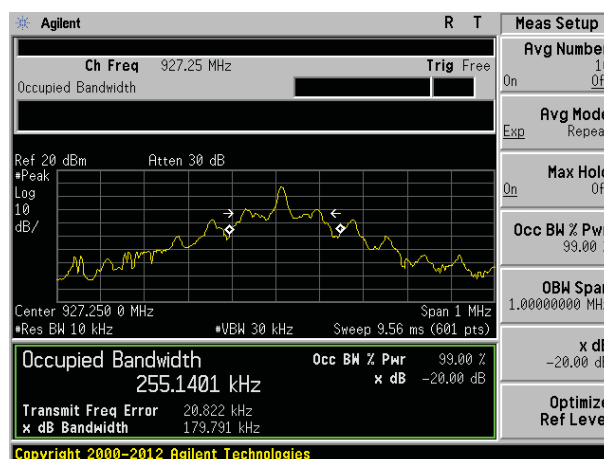
Test plot as follows:



Lowest channel

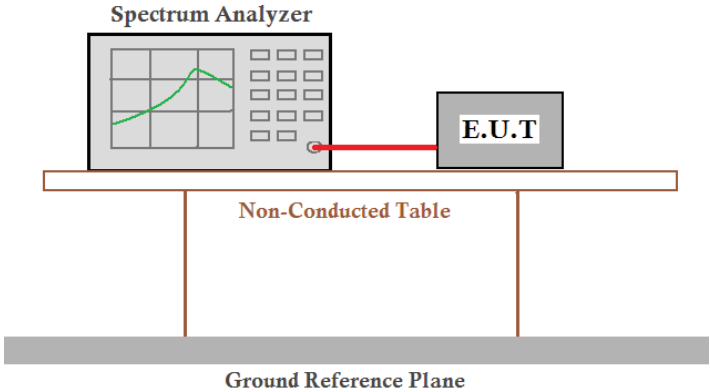


Middle channel



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=10KHz, VBW=30KHz, detector=Peak
Limit:	0.025MHz or of the 20dB bandwidth (whichever is greater)
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer and an E.U.T. (Equipment Under Test) are connected by a red cable. They are positioned on a 'Non-Conducted Table' which has two vertical legs. Below this 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

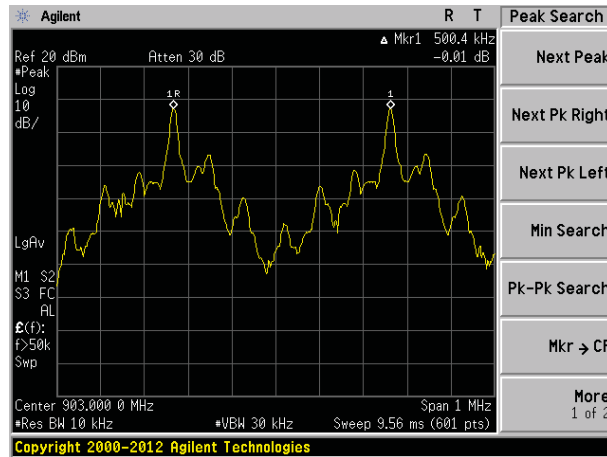
Measurement Data

Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	500.4	179.791	Pass
Middle	500.0	179.791	Pass
Highest	499.5	179.791	Pass

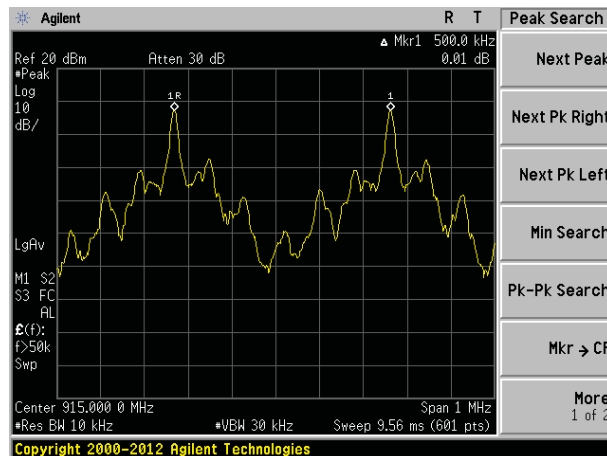
Note: According to section 7.4

Mode	20dB bandwidth (kHz) (worse case)	Limit (kHz) (Carrier Frequencies Separation)
GFSK	179.791	179.791

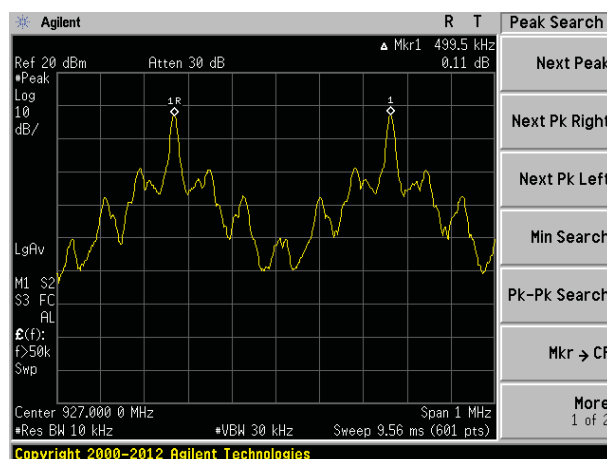
Test plot as follows:



Lowest channel

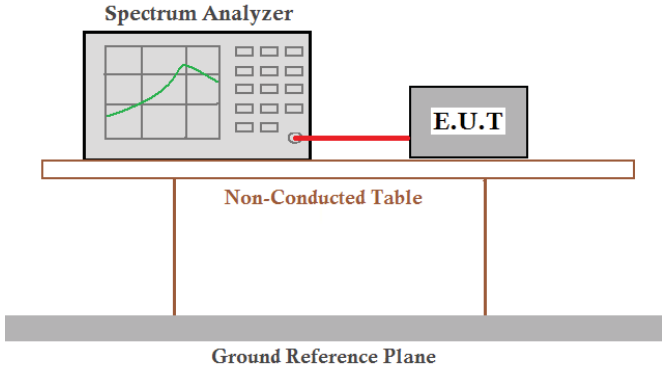


Middle channel



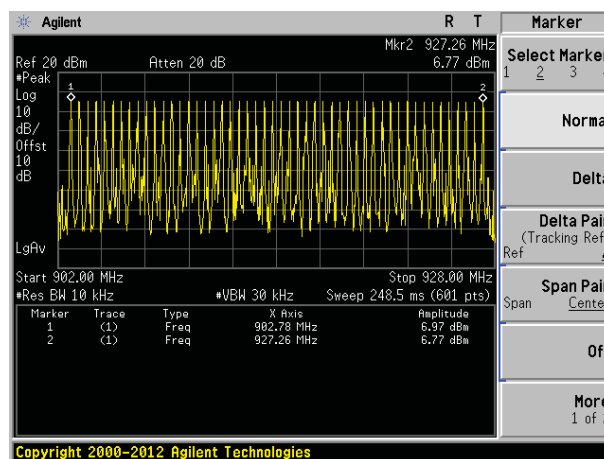
Highest channel

7.6 Hopping Channel Number

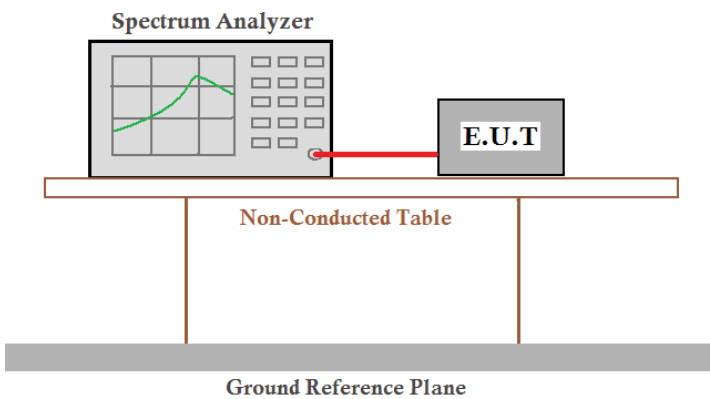
Test Requirement:	FCC Part15 C Section 15.247 (a)(i)
Test Method:	ANSI C63.4:2014
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=902MHz-928MHz, Detector=Peak
Limit:	50 channels
Test setup:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer is connected via a red cable to an E.U.T. (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
50	50	Pass



7.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(i)
Test Method:	ANSI C63.4:2014
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	Ton (ms)	Dwell time(ms)	Limit(ms)	Result
902.75MHz	72.5	346.68	400	Pass
914.75MHz	72.5	346.68	400	Pass
927.25MHz	72.5	346.68	400	Pass

The formula as below:

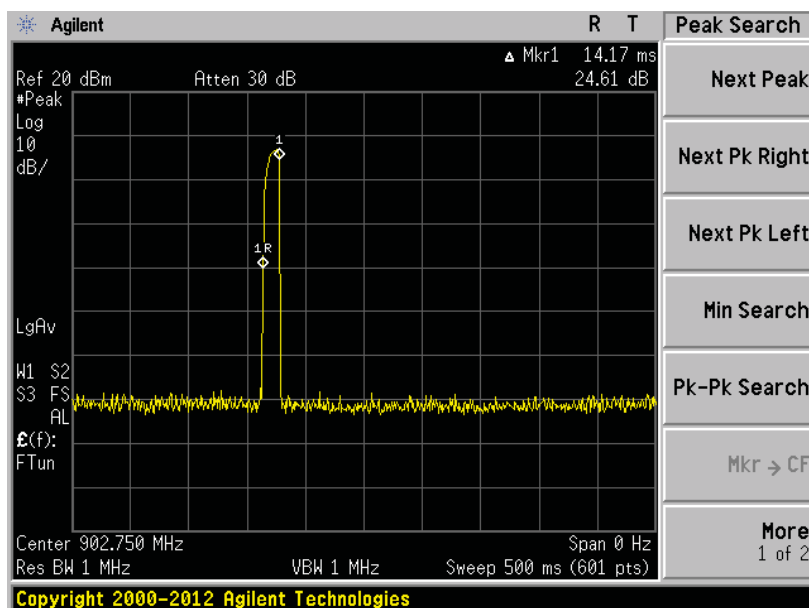
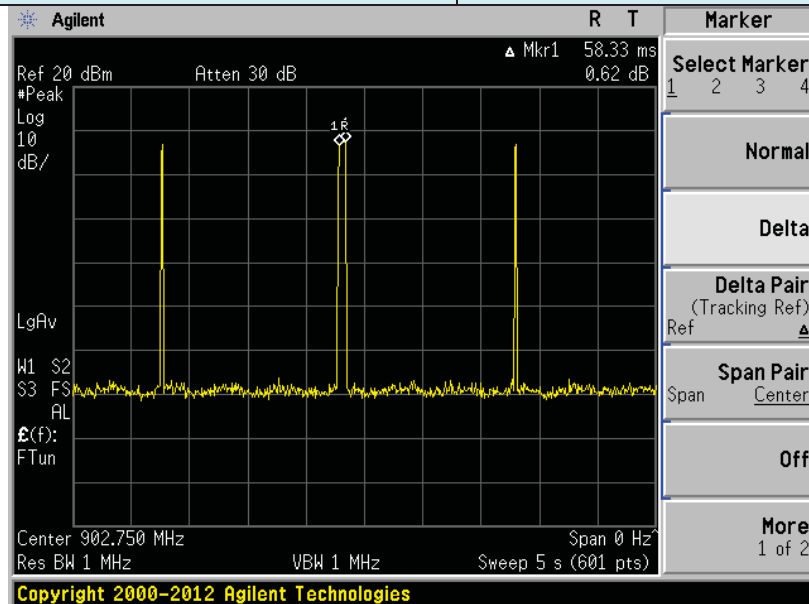
902.75MHz: Dwell time = Ton * Ton times in 5s * (20/5)s = (14.17ms*2+58.33ms)*4=346.68ms

914.75MHz: Dwell time = Ton * Ton times in 5s * (20/5)s = (14.17ms*2+58.33ms)*4=346.68ms

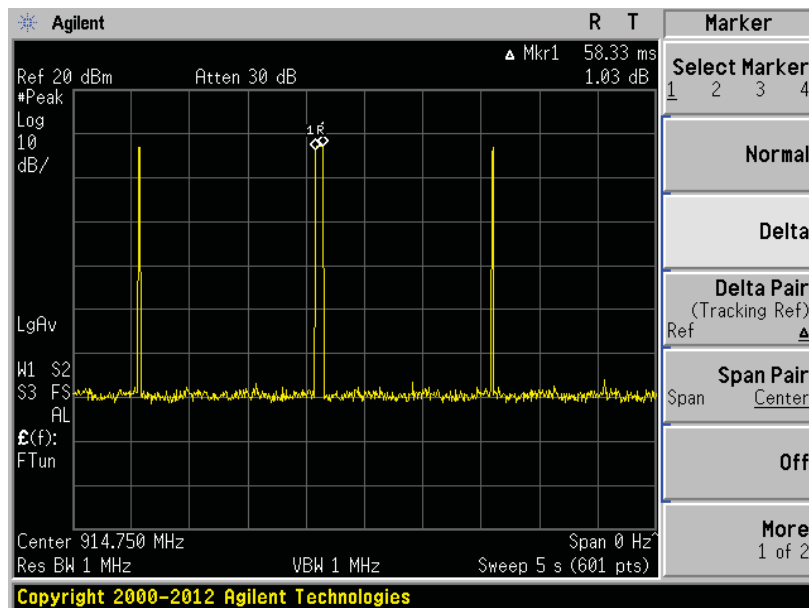
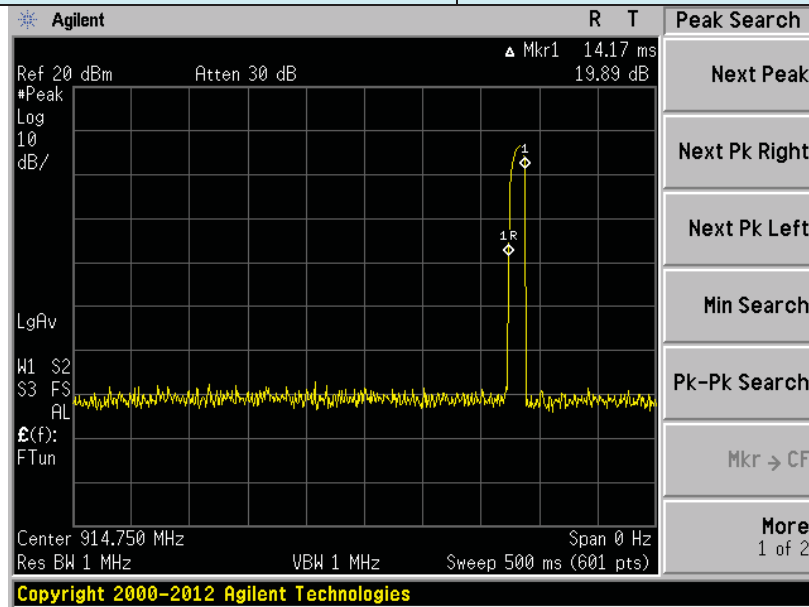
927.25MHz: Dwell time = Ton * Ton times in 5s * (20/5)s = (14.17ms*2+58.33ms)*4=346.68ms

Test plot as follows:

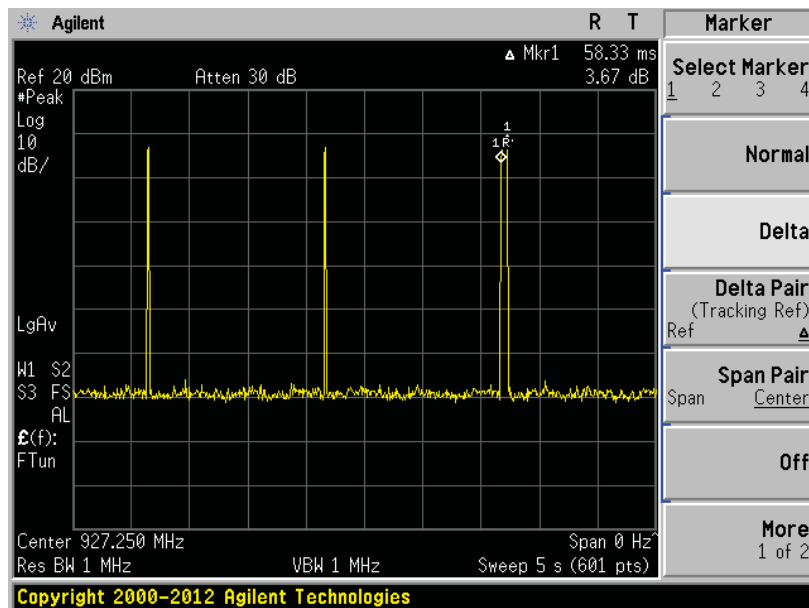
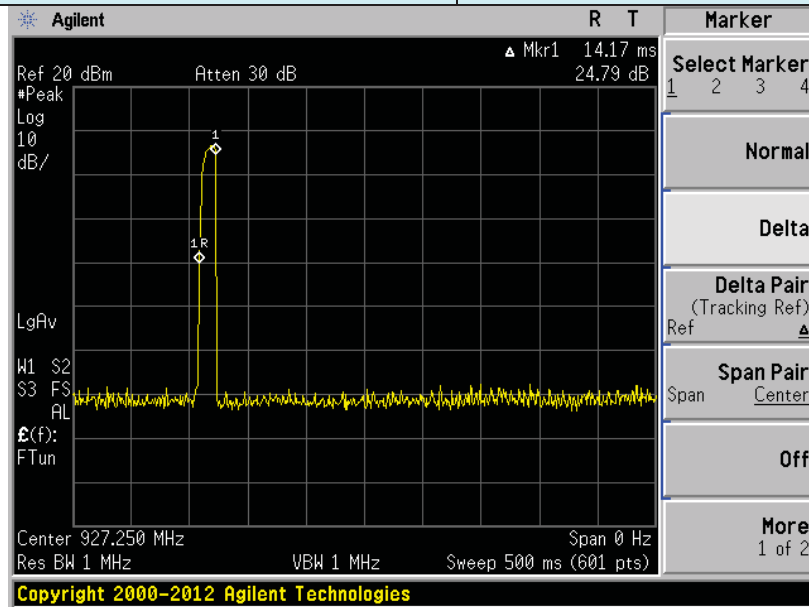
Frequency:	902.25MHz
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Frequency:	914.75MHz
------------	-----------



Frequency:	927.25MHz
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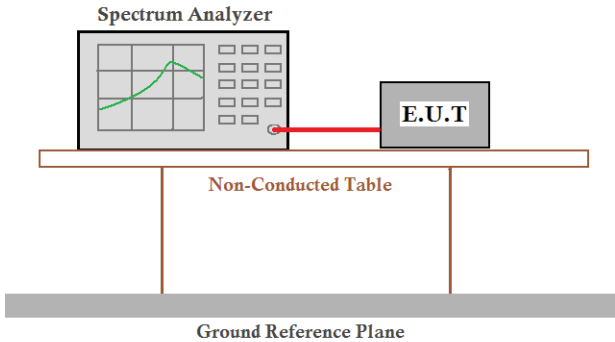


7.8 Pseudorandom Frequency Hopping Sequence

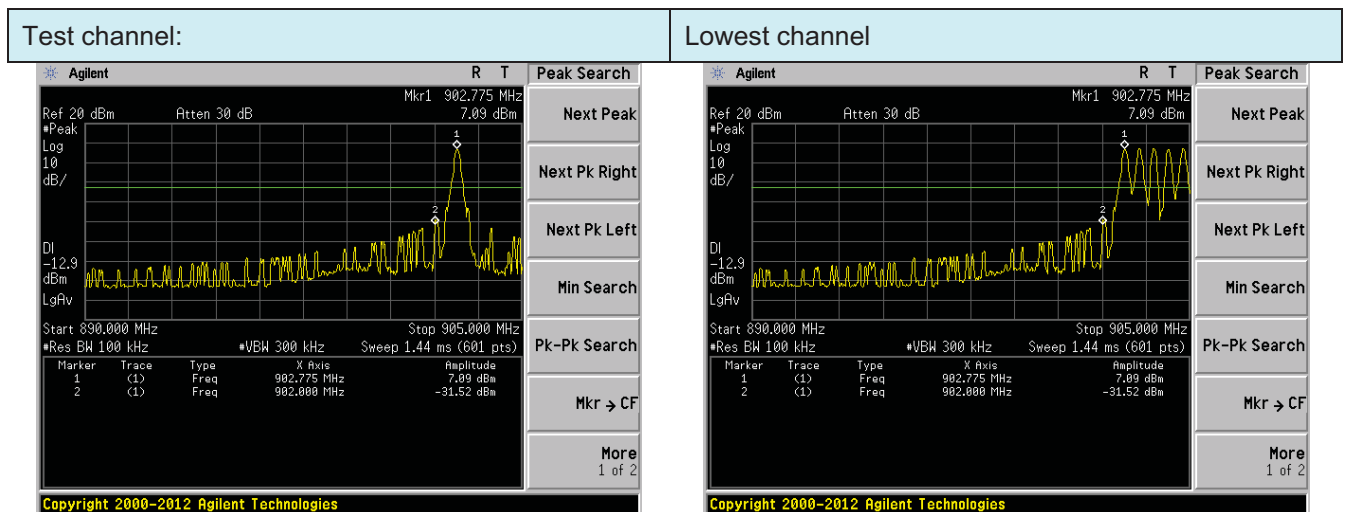
Test Requirement:	FCC Part15 C Section 15.247 (a)(1) requirement:
<p><i>Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.</i></p> <p><i>Alternatively. Frequency hopping systems 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.</i></p>	
EUT Pseudorandom Frequency Hopping Sequence	
<p><i>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.</i></p> <ul style="list-style-type: none"> • Number of shift register stages: 9 • Length of pseudo-random sequence: $2^9 - 1 = 511$ bits • Longest sequence of zeros: 8 (non-inverted signal) <div data-bbox="244 1010 1294 1158" data-label="Diagram"> </div> <p><i>Linear Feedback Shift Register for Generation of the PRBS sequence</i></p> <p><i>An example of Pseudorandom Frequency Hopping Sequence as follow:</i></p> <div data-bbox="244 1261 1243 1411" data-label="Diagram"> </div> <p><i>Each frequency used equally on the average by each transmitter.</i></p> <p><i>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.</i></p>	

7.9 Band Edge

7.9.1 Conducted Emission Method

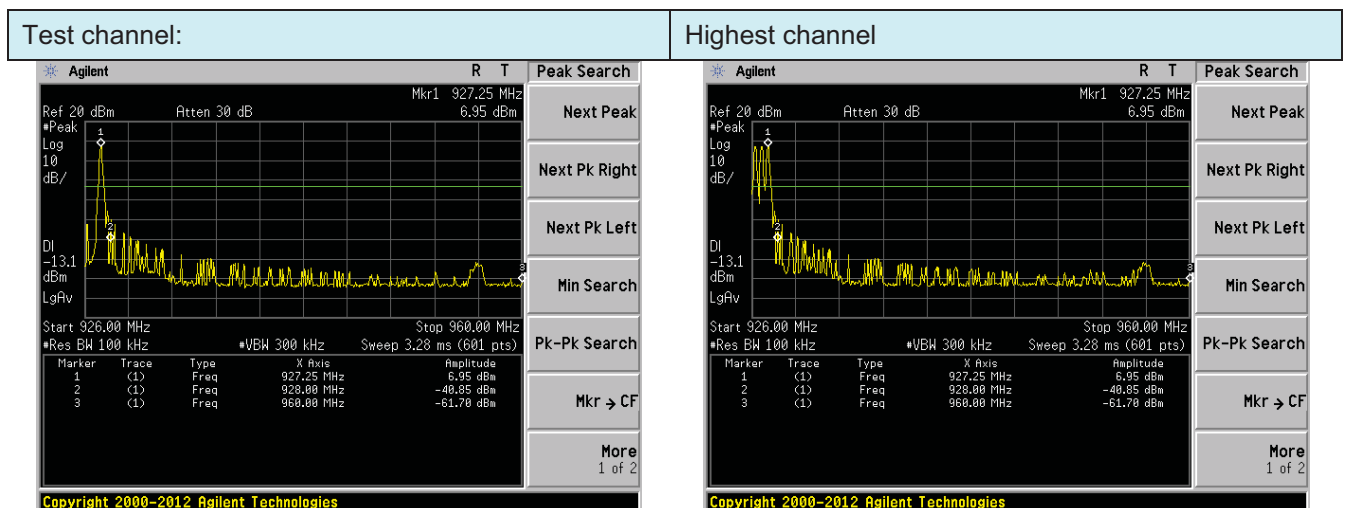
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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:	 <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

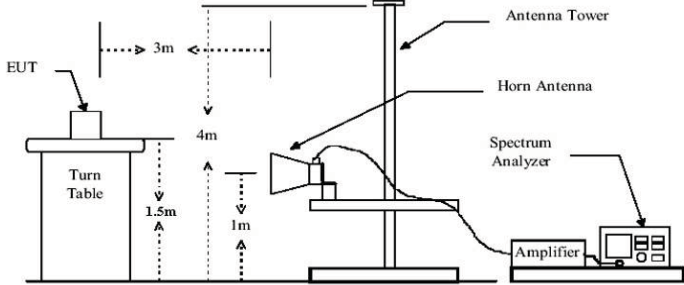
Hopping mode



No-hopping mode

Hopping mode

7.9.2 Radiated Emission Method

Test Requirement:	FCC Part15 C Section 15.209 and 15.205				
Test Method:	ANSI C63.4:2014				
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:	<div>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.</div> <div>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.</div> <div>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.</div> <div>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.</div> <div>5. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.</div> <div>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.</div>				
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.

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
902.00	43.41	23.12	4.87	29.10	42.30	46.00	-3.70	Horizontal
928.00	41.44	23.28	4.96	29.10	40.58	46.00	-5.42	Horizontal
902.00	42.50	23.12	4.87	29.10	41.39	46.00	-4.61	Vertical
928.00	42.00	23.28	4.96	29.10	41.14	46.00	-4.86	Vertical

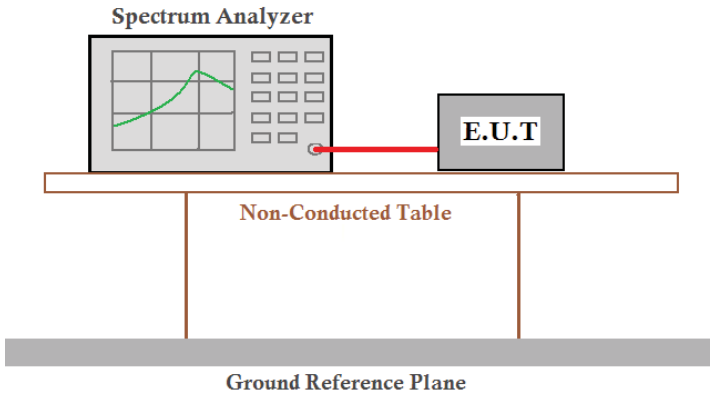
Remark:

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.

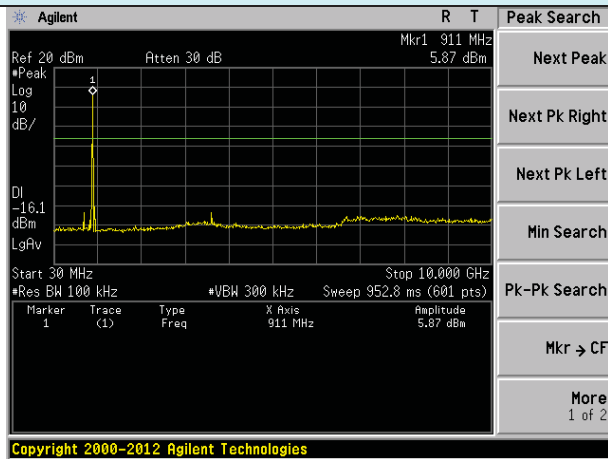
7.10 Spurious Emission

7.10.1 Conducted Emission Method

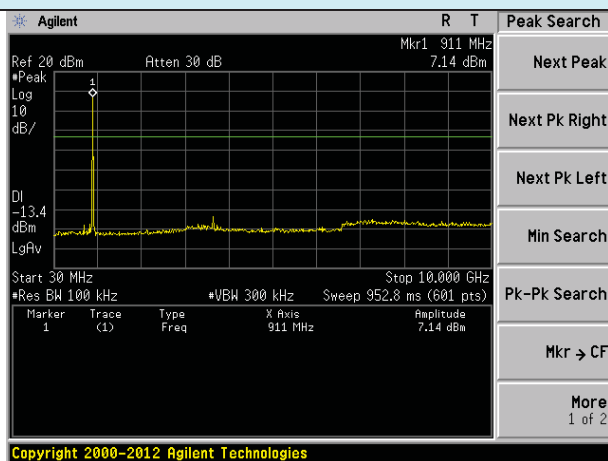
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.10:2013 and KDB558074 D01 Meas Guidance
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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:	 <p>The diagram illustrates the test setup. A Spectrum Analyzer, shown with a green trace on its screen, is connected to an E.U.T. (Equipment Under Test) by a red cable. Both the Spectrum Analyzer and the E.U.T. are positioned on a table labeled 'Non-Conducted Table'. This table is supported by two vertical legs and sits on a thick grey bar labeled '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:

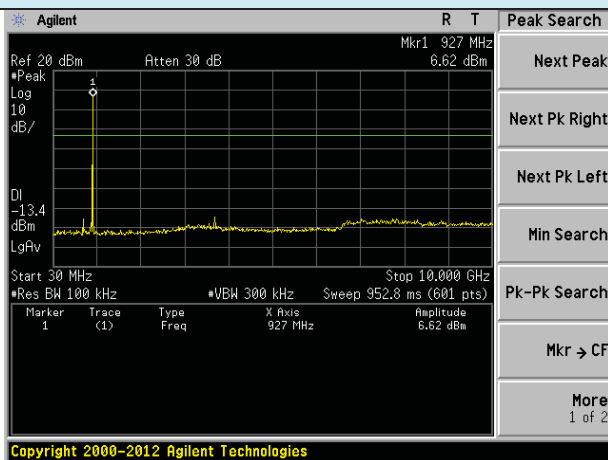
Lowest channel



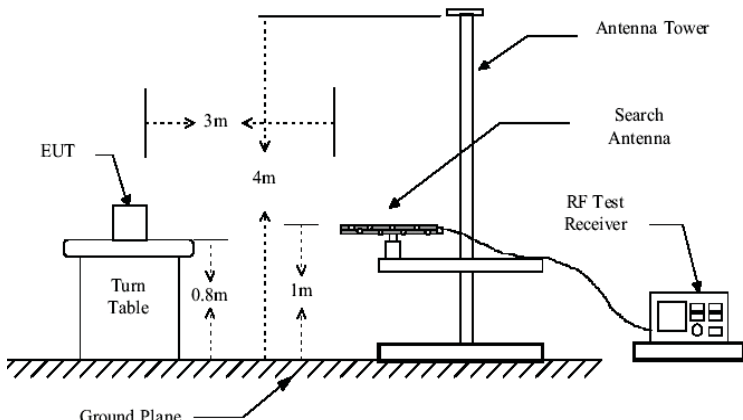
Middle channel

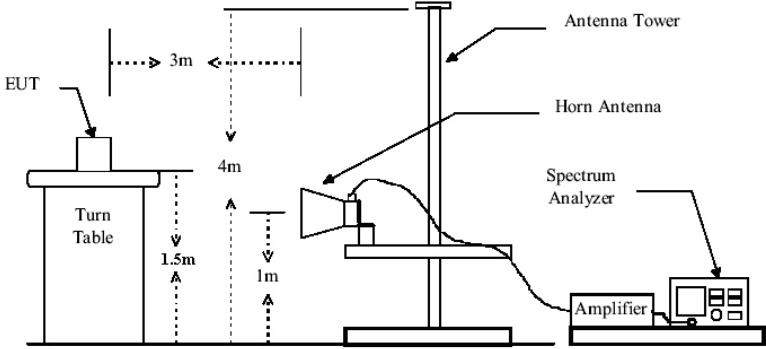


Highest channel



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				
	<div></div>				
Test setup:	Above 1GHz				

	
Test Procedure:	<ol style="list-style-type: none"> 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 5.3 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.

Measurement data:

■ **Below 1GHz**

Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	QP Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
245.95	44.54	14.08	2.10	29.61	31.11	46.00	-14.89	Vertical
327.89	44.56	15.66	2.51	29.84	32.89	46.00	-13.11	Vertical
467.24	47.85	17.77	3.17	29.36	39.43	46.00	-6.57	Vertical
582.74	46.29	20.14	3.66	29.30	40.79	46.00	-5.21	Vertical
729.36	45.38	21.19	4.19	29.20	41.56	46.00	-4.44	Vertical
903.31	43.17	23.12	4.87	29.10	42.06	46.00	-3.94	Vertical
218.31	44.26	13.13	1.95	29.38	29.96	46.00	-16.04	Horizontal
292.06	42.62	14.89	2.32	29.95	29.88	46.00	-16.12	Horizontal
416.18	40.58	17.39	2.93	29.46	31.44	46.00	-14.56	Horizontal
494.20	47.24	18.45	3.28	29.31	39.66	46.00	-6.34	Horizontal
599.32	41.79	20.45	3.72	29.30	36.66	46.00	-9.34	Horizontal
833.32	44.09	22.42	4.58	29.17	41.92	46.00	-4.08	Horizontal

■ Above 1GHz

Test channel:	Lowest channel
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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
1805.50	38.47	25.29	4.86	34.11	34.51	74.00	-39.49	Vertical
2708.25	34.60	28.17	5.68	33.66	34.79	74.00	-39.21	Vertical
3611.00	44.26	29.14	7.17	32.62	47.95	74.00	-26.05	Vertical
4513.75	35.13	31.37	8.34	31.95	42.89	74.00	-31.11	Vertical
5416.50	28.43	31.84	9.40	32.39	37.28	74.00	-36.72	Vertical
6319.25	28.58	33.33	10.65	32.06	40.50	74.00	-33.50	Vertical
7222.00	27.28	36.19	11.66	31.99	43.14	74.00	-30.86	Vertical
8124.75	26.66	37.12	12.32	31.49	44.61	74.00	-29.39	Vertical
9027.50	25.87	37.17	13.67	32.29	44.42	74.00	-29.58	Vertical
1805.50	37.65	25.29	4.86	34.11	33.69	74.00	-40.31	Horizontal
2708.25	35.42	28.17	5.68	33.66	35.61	74.00	-38.39	Horizontal
3611.00	41.25	29.14	7.17	32.62	44.94	74.00	-29.06	Horizontal
4513.75	33.53	31.37	8.34	31.95	41.29	74.00	-32.71	Horizontal
5416.50	28.11	31.84	9.40	32.39	36.96	74.00	-37.04	Horizontal
6319.25	28.47	33.33	10.65	32.06	40.39	74.00	-33.61	Horizontal
7222.00	27.56	36.19	11.66	31.99	43.42	74.00	-30.58	Horizontal
8124.75	26.42	37.12	12.32	31.49	44.37	74.00	-29.63	Horizontal
9027.50	25.44	37.17	13.67	32.29	43.99	74.00	-30.01	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
1805.50	28.54	25.29	4.86	34.11	24.58	54.00	-29.42	Vertical
2708.25	24.57	28.17	5.68	33.66	24.76	54.00	-29.24	Vertical
3611.00	34.16	29.14	7.17	32.62	37.85	54.00	-16.15	Vertical
4513.75	25.70	31.37	8.34	31.95	33.46	54.00	-20.54	Vertical
5416.50	18.65	31.84	9.40	32.39	27.50	54.00	-26.50	Vertical
6319.25	18.37	33.33	10.65	32.06	30.29	54.00	-23.71	Vertical
7222.00	17.68	36.19	11.66	31.99	33.54	54.00	-20.46	Vertical
8124.75	16.87	37.12	12.32	31.49	34.82	54.00	-19.18	Vertical
9027.50	15.33	37.17	13.67	32.29	33.88	54.00	-20.12	Vertical
1805.50	27.68	25.29	4.86	34.11	23.72	54.00	-30.28	Horizontal
2708.25	23.66	28.17	5.68	33.66	23.85	54.00	-30.15	Horizontal
3611.00	33.10	29.14	7.17	32.62	36.79	54.00	-17.21	Horizontal
4513.75	24.85	31.37	8.34	31.95	32.61	54.00	-21.39	Horizontal
5416.50	18.45	31.84	9.40	32.39	27.30	54.00	-26.70	Horizontal
6319.25	18.55	33.33	10.65	32.06	30.47	54.00	-23.53	Horizontal
7222.00	17.62	36.19	11.66	31.99	33.48	54.00	-20.52	Horizontal
8124.75	17.05	37.12	12.32	31.49	35.00	54.00	-19.00	Horizontal
9027.50	15.67	37.17	13.67	32.29	34.22	54.00	-19.78	Horizontal

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.*
3. *“*” means this data is the too weak instrument of signal is unable to test.*

Test channel:	Middle channel
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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
1829.50	35.15	25.42	4.87	34.17	31.27	74.00	-42.73	Vertical
2744.25	33.49	28.24	5.71	33.61	33.83	74.00	-40.17	Vertical
3659.00	32.58	29.20	7.27	32.58	36.47	74.00	-37.53	Vertical
4573.75	33.05	31.47	8.40	31.97	40.95	74.00	-33.05	Vertical
5488.50	30.46	31.98	9.49	32.42	39.51	74.00	-34.49	Vertical
6403.25	28.44	33.46	10.75	32.11	40.54	74.00	-33.46	Vertical
7318.00	27.53	36.37	11.72	31.89	43.73	74.00	-30.27	Vertical
8232.75	26.24	36.76	12.47	31.70	43.77	74.00	-30.23	Vertical
9147.50	26.41	37.31	13.78	32.15	45.35	74.00	-28.65	Vertical
1829.50	36.10	25.42	4.87	34.17	32.22	74.00	-41.78	Horizontal
2744.25	33.14	28.24	5.71	33.61	33.48	74.00	-40.52	Horizontal
3659.00	32.81	29.20	7.27	32.58	36.70	74.00	-37.30	Horizontal
4573.75	32.08	31.47	8.40	31.97	39.98	74.00	-34.02	Horizontal
5488.50	29.48	31.98	9.49	32.42	38.53	74.00	-35.47	Horizontal
6403.25	28.54	33.46	10.75	32.11	40.64	74.00	-33.36	Horizontal
7318.00	27.51	36.37	11.72	31.89	43.71	74.00	-30.29	Horizontal
8232.75	26.71	36.76	12.47	31.70	44.24	74.00	-29.76	Horizontal
9147.50	26.36	37.31	13.78	32.15	45.30	74.00	-28.70	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
1829.50	26.17	25.42	4.87	34.17	22.29	54.00	-31.71	Vertical
2744.25	23.55	28.24	5.71	33.61	23.89	54.00	-30.11	Vertical
3659.00	22.51	29.20	7.27	32.58	26.40	54.00	-27.60	Vertical
4573.75	22.74	31.47	8.40	31.97	30.64	54.00	-23.36	Vertical
5488.50	19.77	31.98	9.49	32.42	28.82	54.00	-25.18	Vertical
6403.25	18.24	33.46	10.75	32.11	30.34	54.00	-23.66	Vertical
7318.00	17.32	36.37	11.72	31.89	33.52	54.00	-20.48	Vertical
8232.75	17.07	36.76	12.47	31.70	34.60	54.00	-19.40	Vertical
9147.50	16.58	37.31	13.78	32.15	35.52	54.00	-18.48	Vertical
1829.50	26.56	25.42	4.87	34.17	22.68	54.00	-31.32	Horizontal
2744.25	23.55	28.24	5.71	33.61	23.89	54.00	-30.11	Horizontal
3659.00	22.57	29.20	7.27	32.58	26.46	54.00	-27.54	Horizontal
4573.75	22.69	31.47	8.40	31.97	30.59	54.00	-23.41	Horizontal
5488.50	19.81	31.98	9.49	32.42	28.86	54.00	-25.14	Horizontal
6403.25	18.70	33.46	10.75	32.11	30.80	54.00	-23.20	Horizontal
7318.00	17.82	36.37	11.72	31.89	34.02	54.00	-19.98	Horizontal
8232.75	16.56	36.76	12.47	31.70	34.09	54.00	-19.91	Horizontal
9147.50	16.59	37.31	13.78	32.15	35.53	54.00	-18.47	Horizontal

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.*
3. *“*” means this data is the too weak instrument of signal is unable to test.*

Test channel:					Highest channel			
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
1854.50	43.05	25.54	4.89	34.20	39.28	74.00	-34.72	Vertical
2781.75	34.86	28.37	5.74	33.57	35.40	74.00	-38.60	Vertical
3709.00	33.86	29.25	7.34	32.52	37.93	74.00	-36.07	Vertical
4636.25	32.15	31.57	8.46	32.01	40.17	74.00	-33.83	Vertical
5563.50	29.00	32.13	9.61	32.40	38.34	74.00	-35.66	Vertical
6490.75	28.48	33.64	10.88	32.15	40.85	74.00	-33.15	Vertical
7418.00	28.14	36.56	11.77	31.80	44.67	74.00	-29.33	Vertical
8345.25	26.05	36.50	12.66	31.94	43.27	74.00	-30.73	Vertical
9272.50	25.96	37.44	13.88	31.99	45.29	74.00	-28.71	Vertical
1854.50	40.52	25.54	4.89	34.20	36.75	74.00	-37.25	Horizontal
2781.75	33.64	28.37	5.74	33.57	34.18	74.00	-39.82	Horizontal
3709.00	33.14	29.25	7.34	32.52	37.21	74.00	-36.79	Horizontal
4636.25	32.05	31.57	8.46	32.01	40.07	74.00	-33.93	Horizontal
5563.50	30.55	32.13	9.61	32.40	39.89	74.00	-34.11	Horizontal
6490.75	28.56	33.64	10.88	32.15	40.93	74.00	-33.07	Horizontal
7418.00	28.41	36.56	11.77	31.80	44.94	74.00	-29.06	Horizontal
8345.25	26.53	36.50	12.66	31.94	43.75	74.00	-30.25	Horizontal
9272.50	25.82	37.44	13.88	31.99	45.15	74.00	-28.85	Horizontal

Average value:

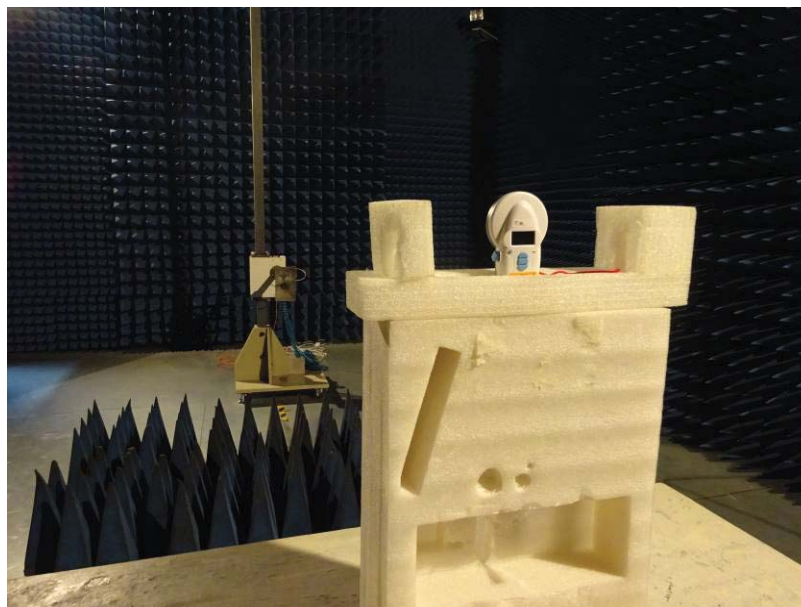
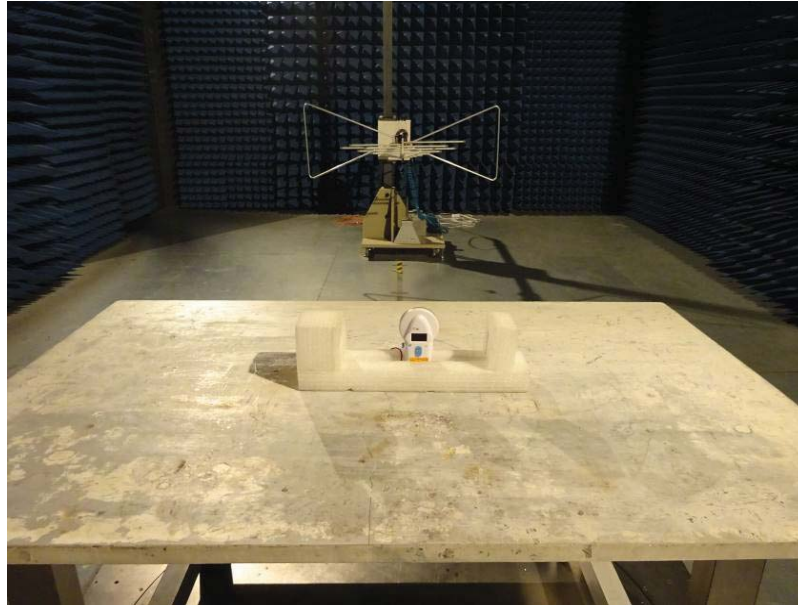
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamplifier Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	polarization
1854.50	33.64	25.54	4.89	34.20	29.87	54.00	-24.13	Vertical
2781.75	25.15	28.37	5.74	33.57	25.69	54.00	-28.31	Vertical
3709.00	23.70	29.25	7.34	32.52	27.77	54.00	-26.23	Vertical
4636.25	22.55	31.57	8.46	32.01	30.57	54.00	-23.43	Vertical
5563.50	19.48	32.13	9.61	32.40	28.82	54.00	-25.18	Vertical
6490.75	18.66	33.64	10.88	32.15	31.03	54.00	-22.97	Vertical
7418.00	18.66	36.56	11.77	31.80	35.19	54.00	-18.81	Vertical
8345.25	16.57	36.50	12.66	31.94	33.79	54.00	-20.21	Vertical
9272.50	15.82	37.44	13.88	31.99	35.15	54.00	-18.85	Vertical
1854.50	33.56	25.54	4.89	34.20	29.79	54.00	-24.21	Horizontal
2781.75	25.14	28.37	5.74	33.57	25.68	54.00	-28.32	Horizontal
3709.00	23.75	29.25	7.34	32.52	27.82	54.00	-26.18	Horizontal
4636.25	22.45	31.57	8.46	32.01	30.47	54.00	-23.53	Horizontal
5563.50	19.86	32.13	9.61	32.40	29.20	54.00	-24.80	Horizontal
6490.75	18.52	33.64	10.88	32.15	30.89	54.00	-23.11	Horizontal
7418.00	18.45	36.56	11.77	31.80	34.98	54.00	-19.02	Horizontal
8345.25	16.85	36.50	12.66	31.94	34.07	54.00	-19.93	Horizontal
9272.50	16.55	37.44	13.88	31.99	35.88	54.00	-18.12	Horizontal

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.*
3. *“*”, means this data is the too weak instrument of signal is unable to test.*

8 Test Setup Photo

Radiated Emission



Conducted Emission

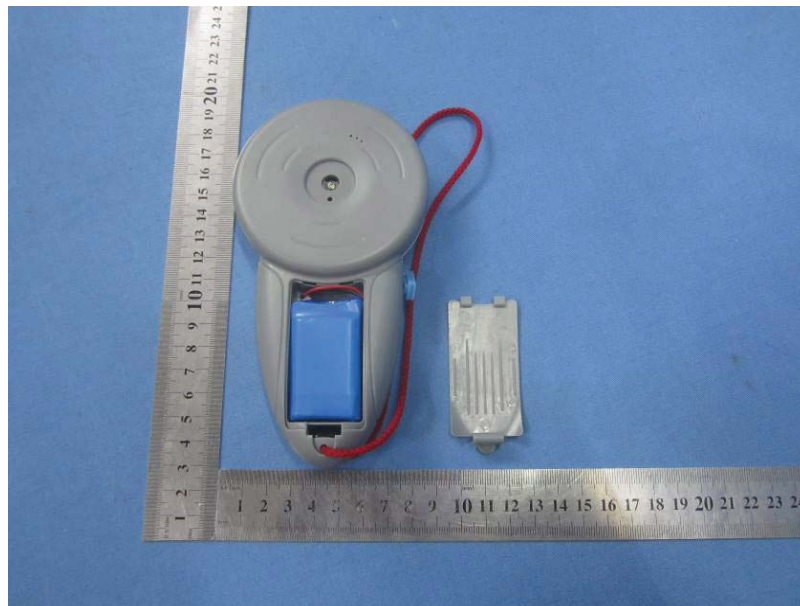


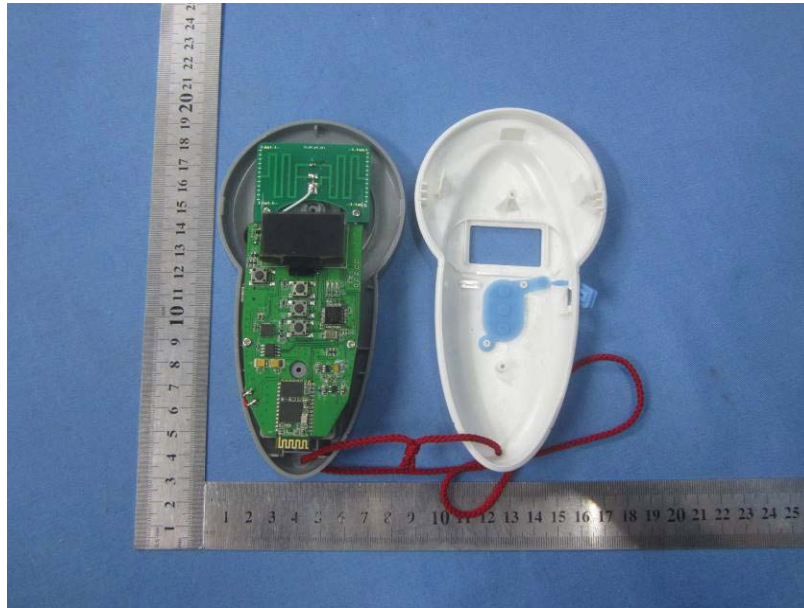
9 EUT Constructional Details

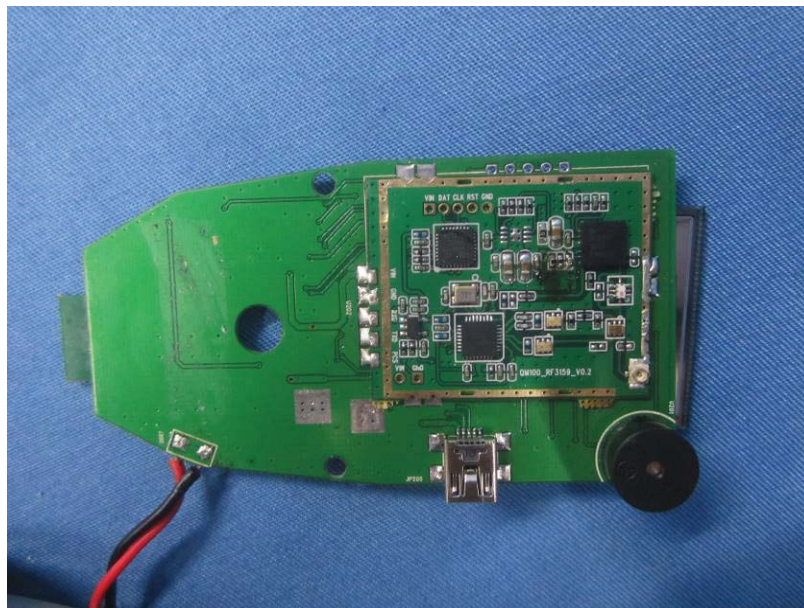
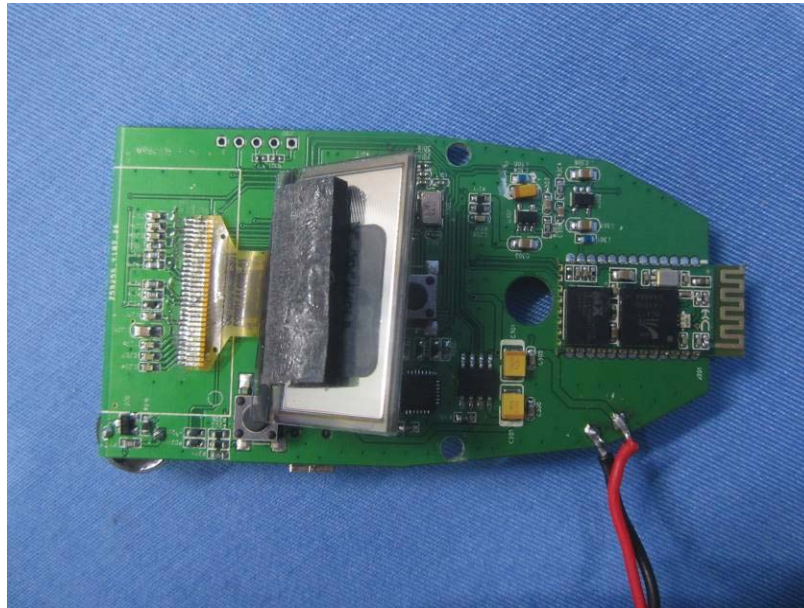


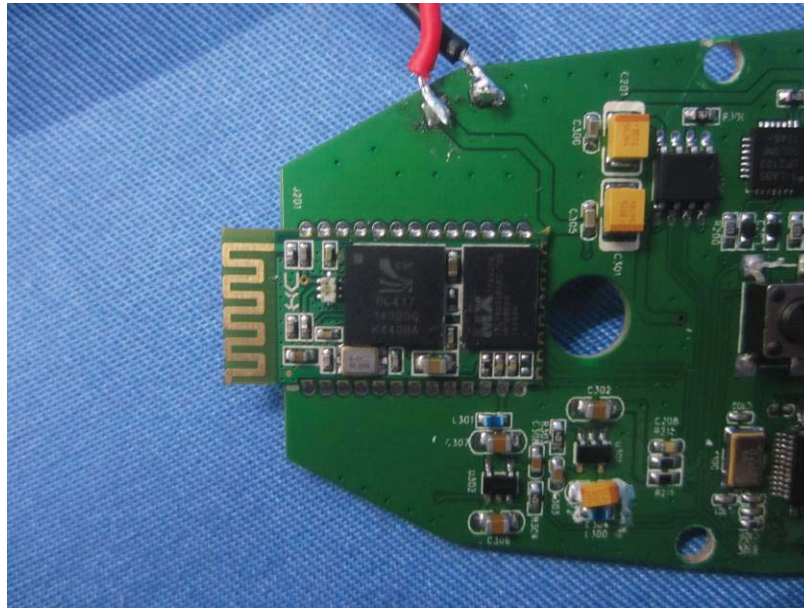












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