Report No: GTSE12090102601

FCC Report

Applicant:	Shenzhen Junlan Electronic Ltd
Address of Applicant:	District 2 type A plant in the second layer 1-4, NO.2 Industrial Fuyuan Tangwei Fuyong Baoan Shenzhen China

Equipment Under Test (EUT)

Product Name:	Bluetooth Speaker
Model No.:	CAB-0111, BT111, BT111GB, BT11GBMO, BT111MO, BT0211, BT0211GB, BT0211GBMO, BT0211MO, BT4111, BT4111GB, BT4111GBMO, BT4111MO, CAB-0135, CAB-0112, CAB-0916, CAB-1431, CAB-1311, CAB-0211, CAB-0211M, CAB-0212, CAB-0504, CAB-0831, CAB-0731,CAB-0631, CAB-0431, CAB-0931, CAB-1031, CAB-1131, CAB-1231, CAB-0431
Trade Mark:	iTrak by Encore Technology
FCC ID:	OKUCAB0111
Applicable standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247:2010
Date of sample receipt:	September 13, 2012
Date of Test:	September 13-17, 2012
Date of report issued:	September 18, 2012
Test Result :	PASS *

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

Authorized Signature:

Robinson Lo
Laboratory Manager

2 Version

Version No.	Date	Description
00	*September 18, 2012*	*Original*

Prepared By: Oscar. Li ***Date:*** *September 18, 2012*

Project Engineer

Check By: Hans. Hu ***Date:*** *September 18, 2012*

Reviewer

3 Contents

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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)&TCB Exclusion List (7 July 2002)	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:	Shenzhen Junlan Electronic Ltd
Address of Applicant:	District 2 type A plant in the second layer 1-4, NO.2 Industrial Fuyuan Tangwei Fuyong Baoan Shenzhen China
Manufacturer:	Shenzhen Junlan Electronic Ltd
Address of Manufacturer:	District 2 type A plant in the second layer 1-4, NO.2 Industrial Fuyuan Tangwei Fuyong Baoan Shenzhen China

5.2 General Description of E.U.T.

Product Name:	Bluetooth Speaker
Model No.:	CAB-0111, BT111, BT111GB, BT11GBMO, BT111MO, BT0211, BT0211GB, BT0211GBMO, BT0211MO, BT4111, BT4111GB, BT4111GBMO, BT4111MO, CAB-0135, CAB-0112, CAB-0916, CAB-1431, CAB-1311, CAB-0211, CAB-0211M, CAB-0212, CAB-0504, CAB-0831, CAB-0731, CAB-0631, CAB-0431, CAB-0931, CAB-1031, CAB-1131, CAB-1231, CAB-0431
Remark:	Only the model No. BT111GB was tested. BT111, BT11GBMO, BT111MO, BT0211, BT0211GB, BT0211GBMO, BT0211MO BT4111, BT4111GB, BT4111GBMO, BT4111MO, CAB-0135, CAB-0112, CAB-0916, CAB-1431, CAB-1311, CAB-0211, CAB-0211M, CAB-0212, CAB-0504, CAB-0831, CAB-0731, CAB-0631, CAB-0431, CAB-0931, CAB-1031, CAB-1131, CAB-1231, CAB-0431, CAB-0111 and BT111GB are identical in the same interior structure, electrical circuits, components and appearance. The only difference is the model name for the marketing requirement.
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK, Pi/4QPSK, 8DPSK
Antenna Type:	Integral
Antenna gain:	2dBi
Power supply:	Model No.: SW018S050250U1 Input: AC 100-240V, 50/60Hz, 0.5A Output: DC 5.0V, 2.5A DC 3.7V Li-ion Battery

Operation Frequency each of channel							
Channel	Frequency	Channel	Frequency	Channel	Frequency	Channel	Frequency
1	2402MHz	21	2422MHz	41	2442MHz	61	2462MHz
2	2403MHz	22	2423MHz	42	2443MHz	62	2463MHz
3	2404MHz	23	2424MHz	43	2444MHz	63	2464MHz
4	2405MHz	24	2425MHz	44	2445MHz	64	2465MHz
5	2406MHz	25	2426MHz	45	2446MHz	65	2466MHz
6	2407MHz	26	2427MHz	46	2447MHz	66	2467MHz
7	2408MHz	27	2428MHz	47	2448MHz	67	2468MHz
8	2409MHz	28	2429MHz	48	2449MHz	68	2469MHz
9	2410MHz	29	2430MHz	49	2450MHz	69	2470MHz
10	2411MHz	30	2431MHz	50	2451MHz	70	2471MHz
11	2412MHz	31	2432MHz	51	2452MHz	71	2472MHz
12	2413MHz	32	2433MHz	52	2453MHz	72	2473MHz
13	2414MHz	33	2434MHz	53	2454MHz	73	2474MHz
14	2415MHz	34	2435MHz	54	2455MHz	74	2475MHz
15	2416MHz	35	2436MHz	55	2456MHz	75	2476MHz
16	2417MHz	36	2437MHz	56	2457MHz	76	2477MHz
17	2418MHz	37	2438MHz	57	2458MHz	77	2478MHz
18	2419MHz	38	2439MHz	58	2459MHz	78	2479MHz
19	2420MHz	39	2440MHz	59	2460MHz	79	2480MHz
20	2421MHz	40	2441MHz	60	2461MHz		

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	2402MHz
The middle channel	2441MHz
The Highest channel	2480MHz

5.3 Test mode

Bluetooth mode	Keep the EUT in continuously transmitting mode.
Transmitter mode	Keep the EUT in transmitting mode.

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 fuly described in a report filed with the (FCC) Federal Communications Commission.

The acceptance letter from the FCC is maintained in out files. Registration 600491, July 20, 2010.

● **Industry Canada (IC)**

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-1.

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

Manufacturer	Description	Model	Serial Number	FCC ID/DoC
Nokia	Mobile Phone	5250	GTS2178	FCC ID: QTKRM-684

5.8 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. 30 2011	Mar. 29 2013
2	Control Room	ZhongYu Electron	6.2(L)*2.5(W)* 2.4(H)	GTS251	N/A	N/A
3	EMI Test Receiver	Rohde & Schwarz	ESU26	GTS203	Jul. 03 2012	Jul. 02 2013
4	BiConiLog Antenna	SCHWARZBECK MESS-ELEKTRONIK	VULB9163	GTS214	Feb. 25 2012	Feb. 24 2013
5	Double -ridged waveguide horn	SCHWARZBECK MESS-ELEKTRONIK	9120D-829	GTS208	June 29 2012	June 28 2013
6	Horn Antenna	ETS-LINDGREN	3160	GTS217	Mar. 30 2011	Mar. 29 2013
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A
8	Coaxial Cable	GTS	N/A	GTS213	Mar. 31 2012	Mar. 30 2013
9	Coaxial Cable	GTS	N/A	GTS211	Mar. 31 2012	Mar. 30 2013
10	Coaxial cable	GTS	N/A	GTS210	Mar. 31 2012	Mar. 30 2013
11	Coaxial Cable	GTS	N/A	GTS212	Mar. 31 2012	Mar. 30 2013
12	Amplifier(100kHz-3GHz)	HP	8347A	GTS204	Jul. 03 2012	Jul. 02 2013
13	Amplifier(2GHz-20GHz)	HP	8349B	GTS206	Jul. 03 2012	Jul. 02 2013
14	Amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	GTS218	June 29 2012	June 28 2013
15	Band filter	Amindeon	82346	GTS219	Mar. 31 2012	Mar. 30 2013

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. 08 2011	Sep. 07 2013
2	EMI Test Receiver	Rohde & Schwarz	ESCS30	GTS223	Jul. 03 2012	Jul. 02 2013
3	10dB Pulse Limita	Rohde & Schwarz	N/A	GTS224	Jul. 03 2012	Jul. 02 2013
4	Coaxial Switch	ANRITSU CORP	MP59B	GTS225	Jul. 03 2012	Jul. 02 2013
5	LISN	SCHWARZBECK MESS-ELEKTRONIK	NSLK 8127	GTS226	Jul. 03 2012	Jul. 02 2013
6	Coaxial Cable	GTS	N/A	GTS227	Jul. 03 2012	Jul. 02 2013
7	EMI Test Software	AUDIX	E3	N/A	N/A	N/A

6 Test results and Measurement Data

6.1 Antenna requirement:

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

15.203 requirement:

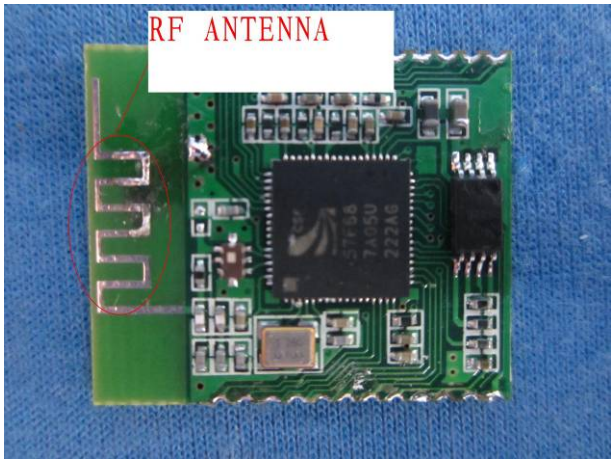
An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator, the manufacturer may design the unit 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:

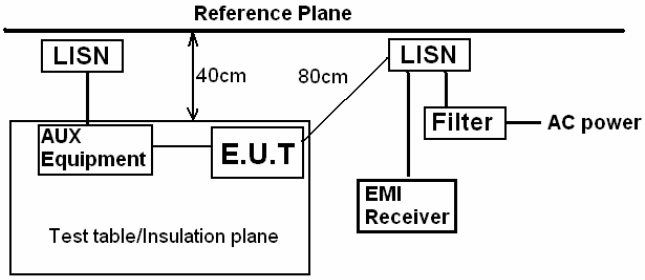
(i) Systems operating in the 2400-2483.5 MHz band that is used exclusively for fixed. Point-to-point operations may employ transmitting antennas with directional gain greater than 6dBi provided the maximum conducted output power of the intentional radiator is reduced by 1 dB for every 3 dB that the directional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

E.U.T Antenna:

The antenna is integral antenna, the best case gain of the antenna is 2dBi

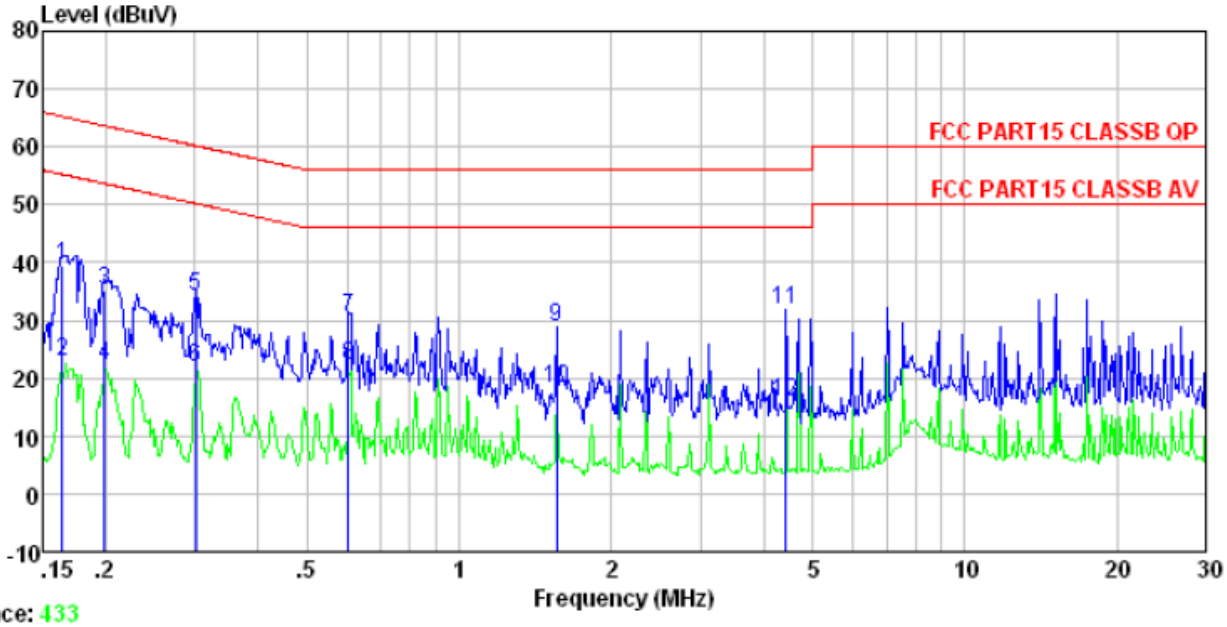


6.2 Conducted Emissions

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:	 *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 C63.4: 2003 on conducted measurement.
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement data:

Line:

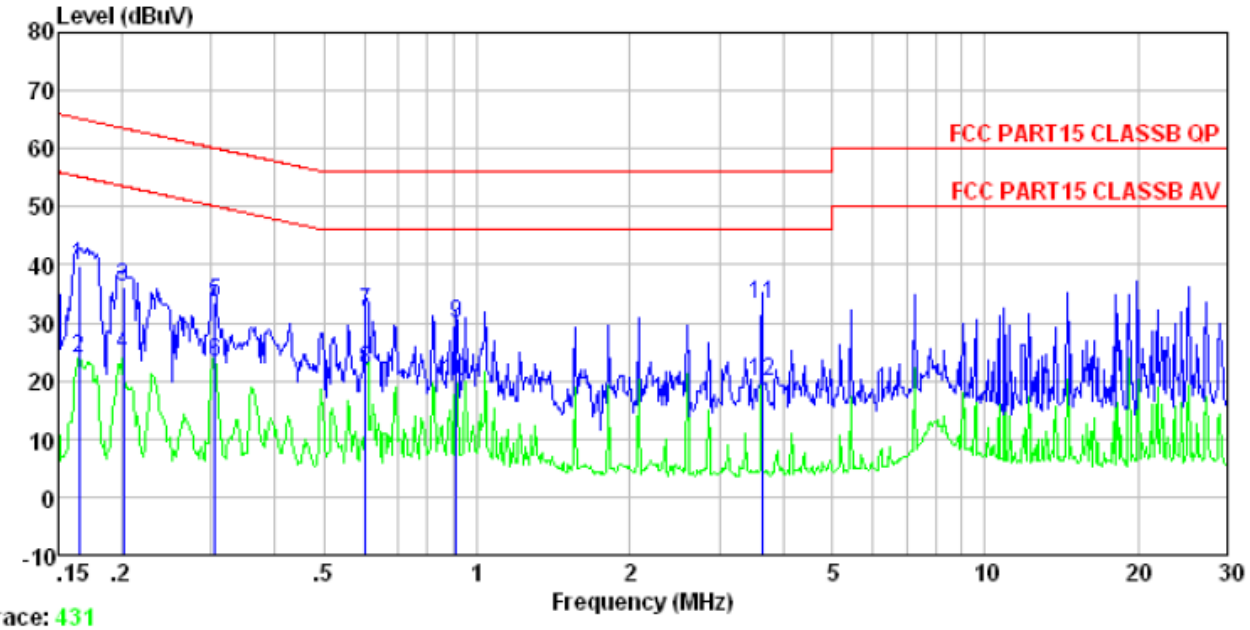


Trace: 433

Condition : FCC PART15 CLASSB QP LISN-2012 LINE
Job No. : 1026RF
Test Mode : Bluetooth mode
Test Engineer: Blue

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.164	39.67	-0.26	0.10	39.51	65.25	-25.74	QP
2	0.164	23.00	-0.26	0.10	22.84	55.25	-32.41	Average
3	0.199	35.24	-0.23	0.10	35.11	63.67	-28.56	QP
4	0.199	22.30	-0.23	0.10	22.17	53.67	-31.50	Average
5	0.302	34.45	-0.22	0.10	34.33	60.19	-25.86	QP
6	0.302	22.10	-0.22	0.10	21.98	50.19	-28.21	Average
7	0.604	30.48	-0.20	0.10	30.38	56.00	-25.62	QP
8	0.604	22.40	-0.20	0.10	22.30	46.00	-23.70	Average
9	1.560	28.87	-0.23	0.10	28.74	56.00	-27.26	QP
10	1.560	18.30	-0.23	0.10	18.17	46.00	-27.83	Average
11	4.430	31.90	-0.29	0.10	31.71	56.00	-24.29	QP
12	4.430	16.10	-0.29	0.10	15.91	46.00	-30.09	Average

Neutral:



Trace: 431

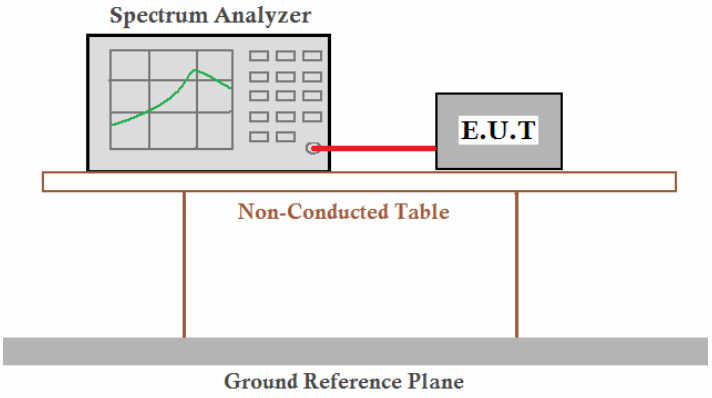
Condition : FCC PART15 CLASSB QP LISN-2012 NEUTRAL
Job No. : 1026RF
Test Mode : Bluetooth mode
Test Engineer: Blue

	Freq	Read Level	LISN Factor	Cable Loss	Level	Limit Line	Over Limit	Remark
	MHz	dBuV	dB	dB	dBuV	dBuV	dB	
1	0.165	39.87	-0.13	0.10	39.84	65.21	-25.37	QP
2	0.165	24.00	-0.13	0.10	23.97	55.21	-31.24	Average
3	0.202	36.05	-0.09	0.10	36.06	63.54	-27.48	QP
4	0.202	24.50	-0.09	0.10	24.51	53.54	-29.03	Average
5	0.305	33.40	-0.09	0.10	33.41	60.10	-26.69	QP
6	0.305	23.20	-0.09	0.10	23.21	50.10	-26.89	Average
7	0.604	31.68	-0.08	0.10	31.70	56.00	-24.30	QP
8	0.604	22.00	-0.08	0.10	22.02	46.00	-23.98	Average
9	0.909	29.98	-0.09	0.10	29.99	56.00	-26.01	QP
10	0.909	20.00	-0.09	0.10	20.01	46.00	-25.99	Average
11	3.642	33.11	-0.14	0.10	33.07	56.00	-22.93	QP
12	3.642	20.00	-0.14	0.10	19.96	46.00	-26.04	Average

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

6.3 Conducted Peak Output Power

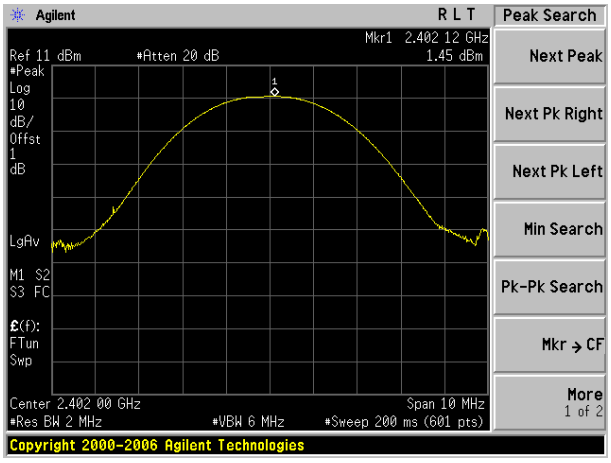
Test Requirement:	FCC Part15 C Section 15.247 (b)(3)
Test Method:	ANSI C63.4:2003
Limit:	30dBm
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

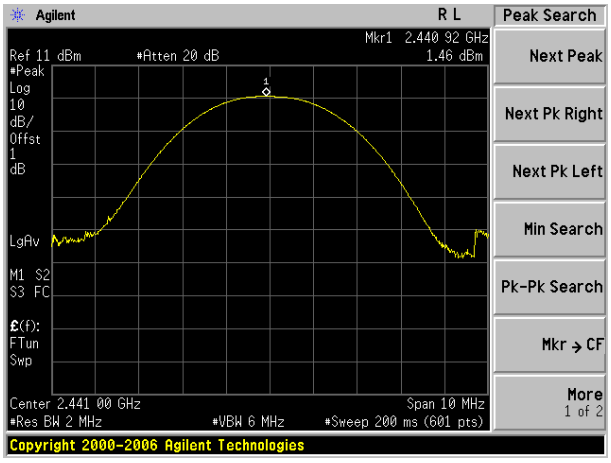
GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	1.45	30.00	Pass
Middle	1.46		
Highest	0.59		
Pi/4QPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.37	30.00	Pass
Middle	0.02		
Highest	-0.62		
8DPSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	0.39	30.00	Pass
Middle	0.03		
Highest	-0.66		

Test plot as follows:

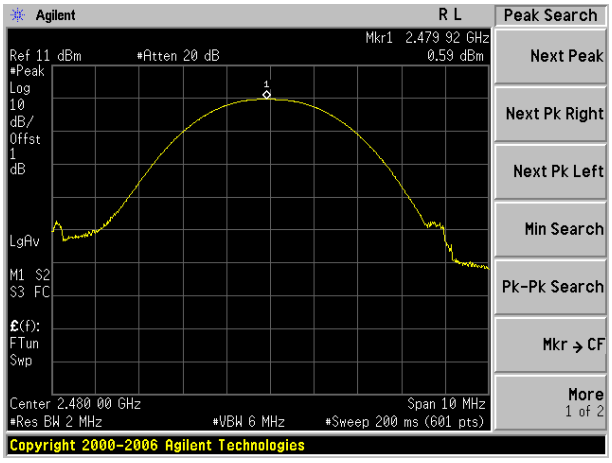
Test mode:	GFSK mode



Lowest channel

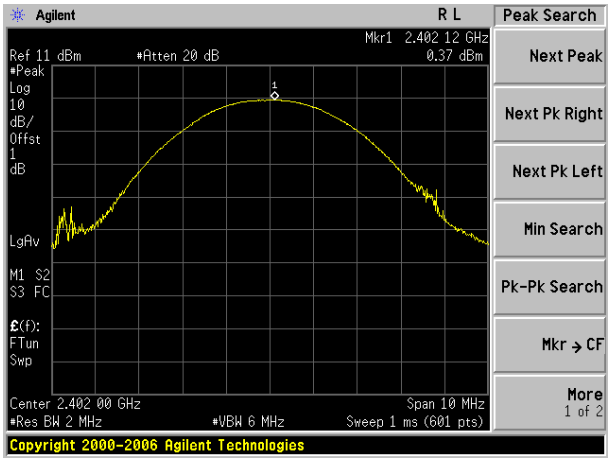


Middle channel

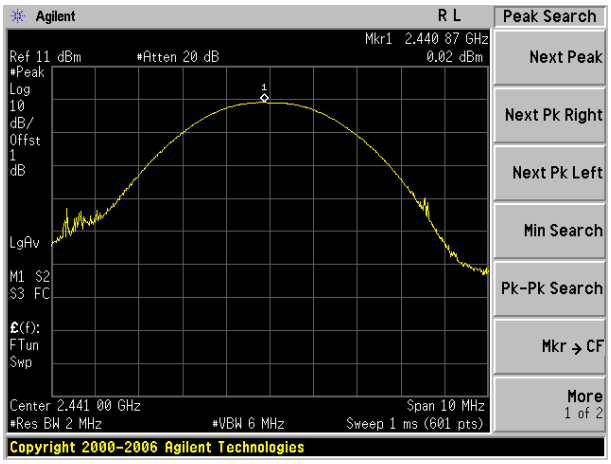


Highest channel

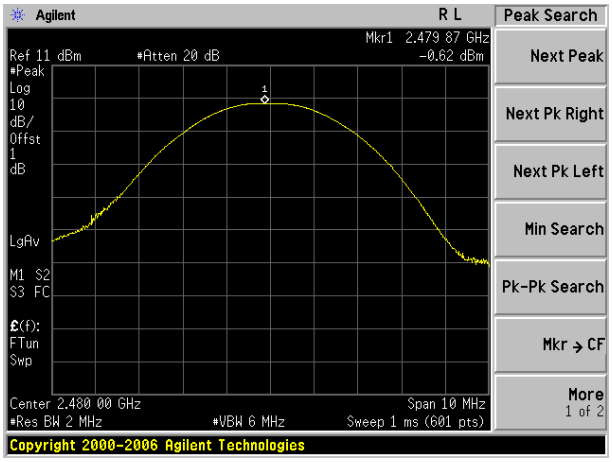
Test mode:	Pi/4QPSK mode



Lowest channel

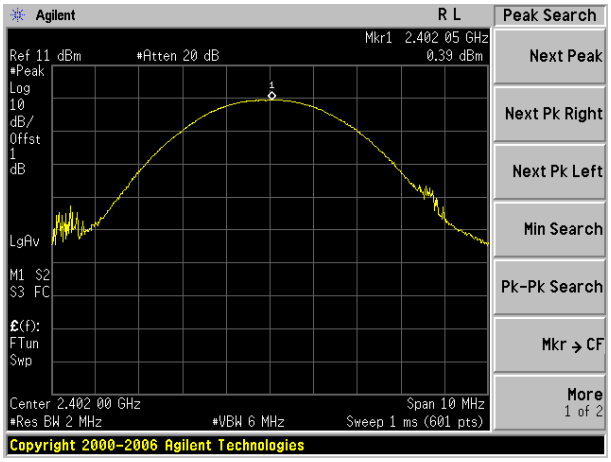


Middle channel

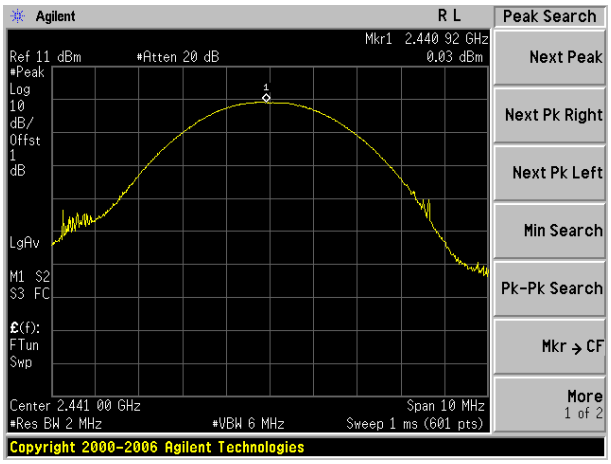


Highest channel

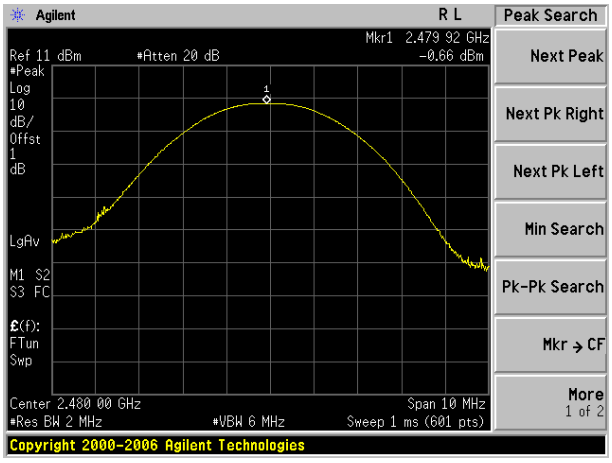
Test mode:	8DPSK mode



Lowest channel

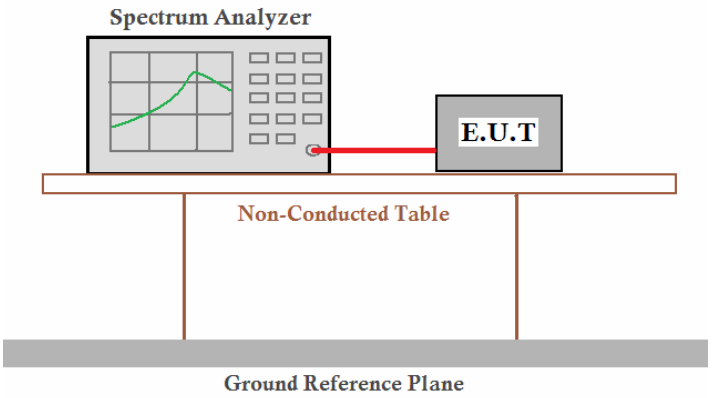


Middle channel



Highest channel

6.4 20dB Emission Bandwidth

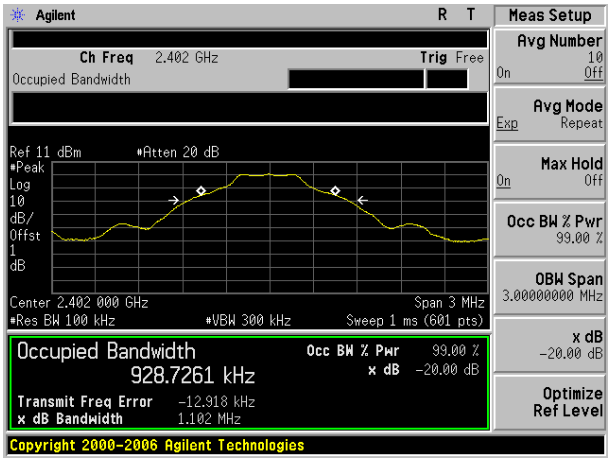
Test Requirement:	FCC Part15 C Section 15.247 (a)(2)
Test Method:	ANSI C63.4:2003
Limit:	N/A
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

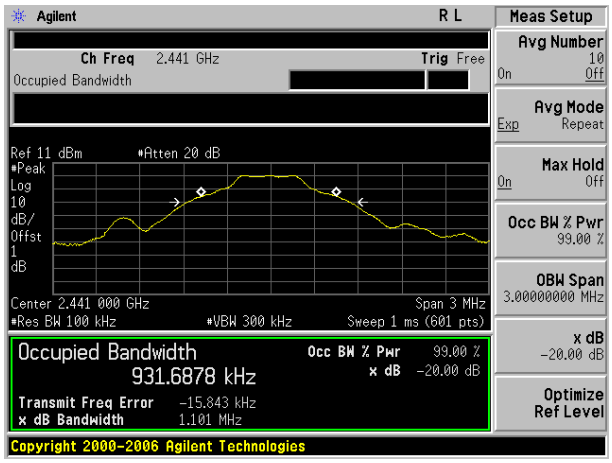
Test channel	20dB Emission Bandwidth (MHz)			Result
	GFSK	Pi/4QPSK	8DPSK	
Lowest	1.102	1.393	1.390	Pass
Middle	1.101	1.383	1.383	
Highest	1.086	1.381	1.374	

Test plot as follows:

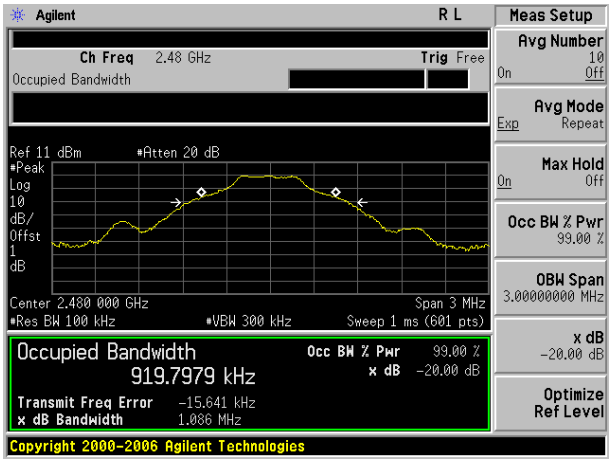
Test mode:	GFSK mode



Lowest channel

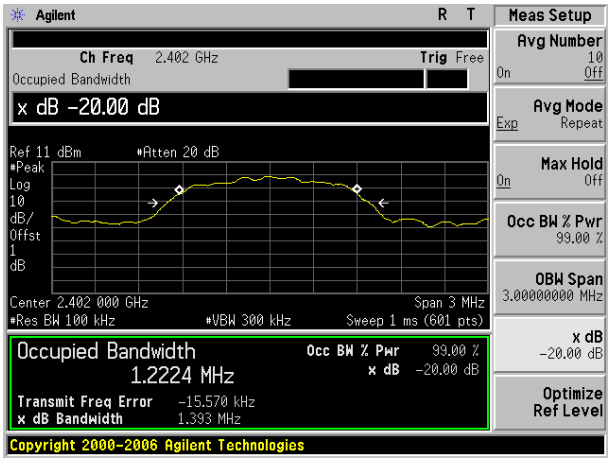


Middle channel

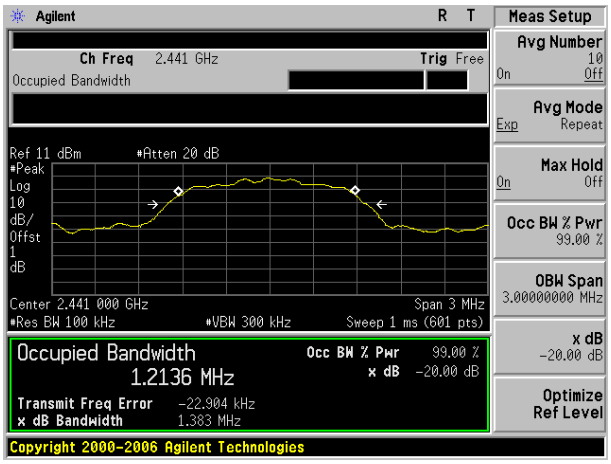


Highest channel

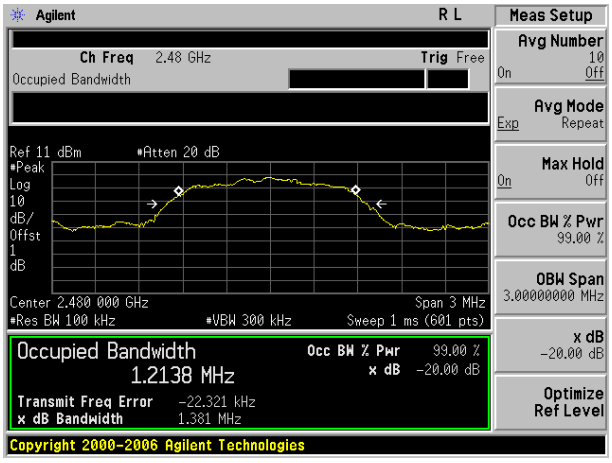
Test mode:	Pi/4QPSK mode



Lowest channel

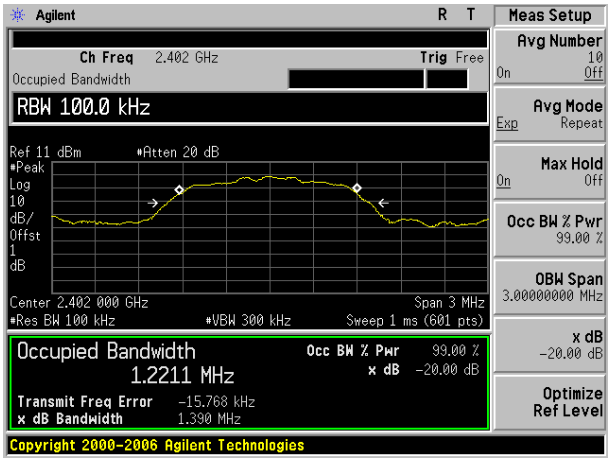


Middle channel

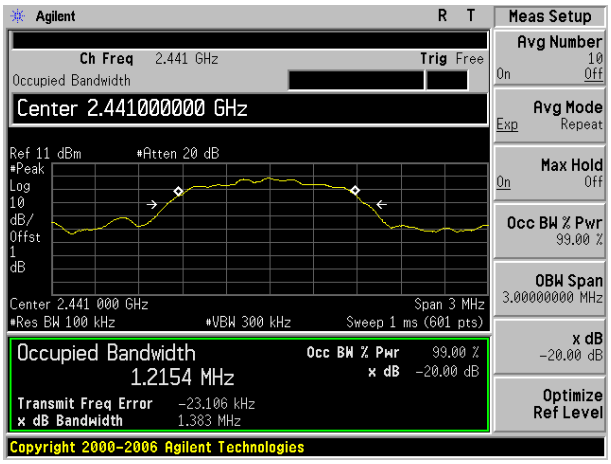


Highest channel

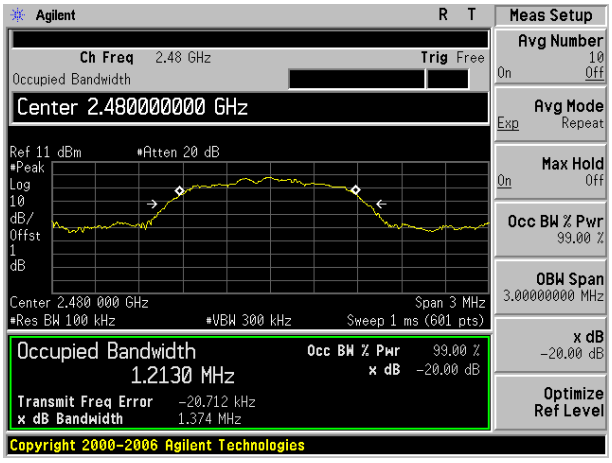
Test mode:	8DPSK mode



Lowest channel

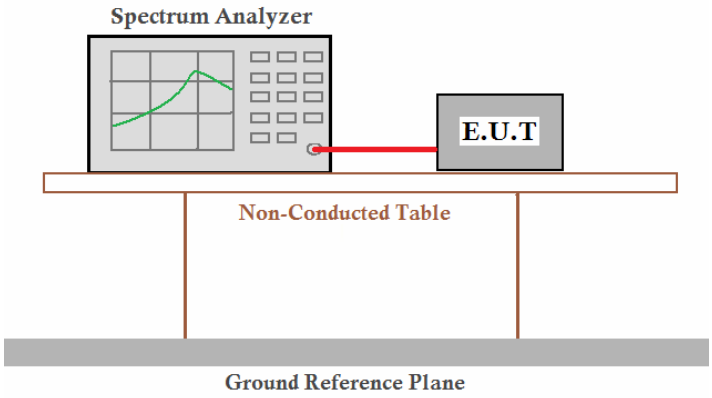


Middle channel



Highest channel

6.5 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 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

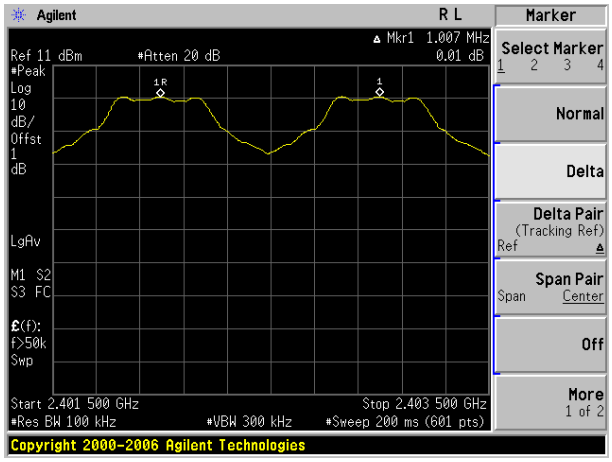
GFSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1007	735	Pass
Middle	1010	735	Pass
Highest	1000	735	Pass
Pi/4QPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1000	929	Pass
Middle	1000	929	Pass
Highest	1003	929	Pass
8DPSK mode			
Test channel	Carrier Frequencies Separation (kHz)	Limit (kHz)	Result
Lowest	1003	927	Pass
Middle	1010	927	Pass
Highest	1010	927	Pass

Note: According to section 6.3

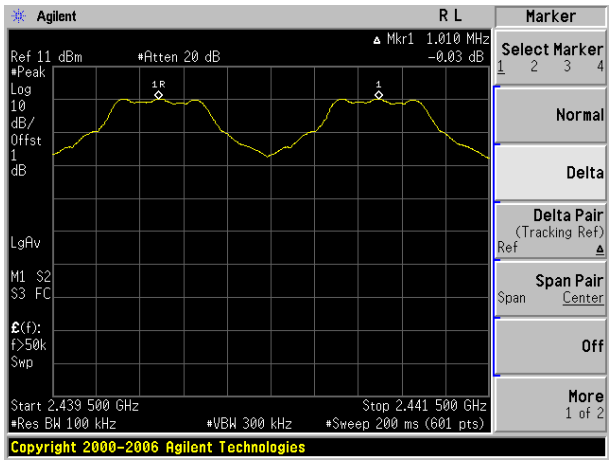
Mode	*20dB bandwidth (kHz) (worse case)*	*Limit (kHz) (Carrier Frequencies Separation)*
GFSK	*1094*	*735*
PI/4QPSK	*1418*	*929*
8DPSK	*1397*	*927*

Test plot as follows:

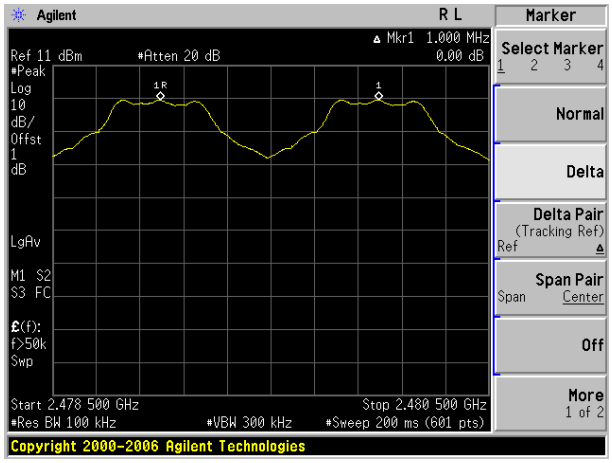
Modulation mode:	GFSK



Lowest channel

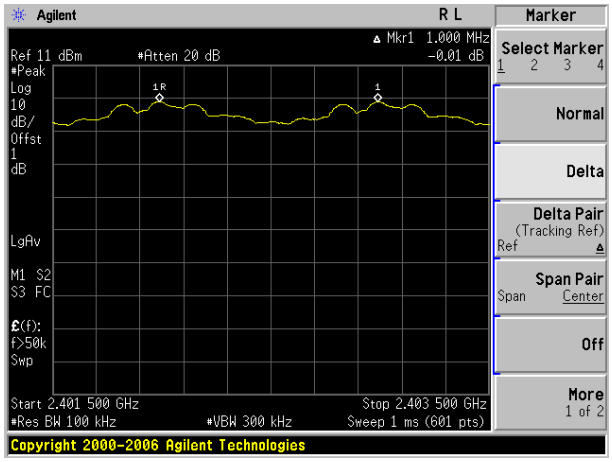


Middle channel

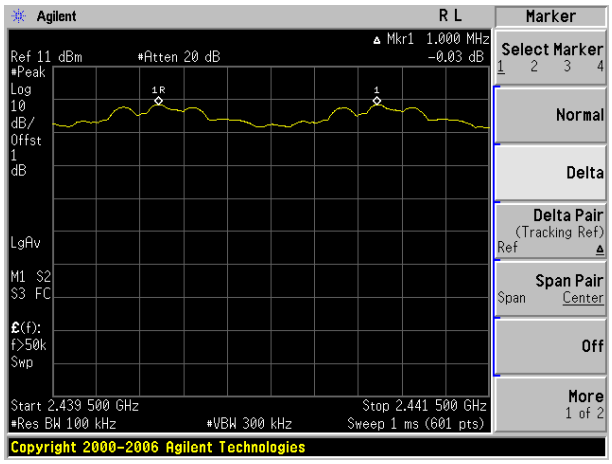


Highest channel

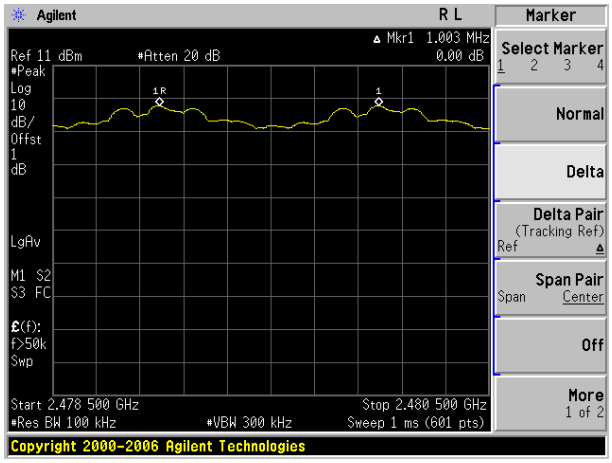
Modulation mode:	Pi/4QPSK



Lowest channel

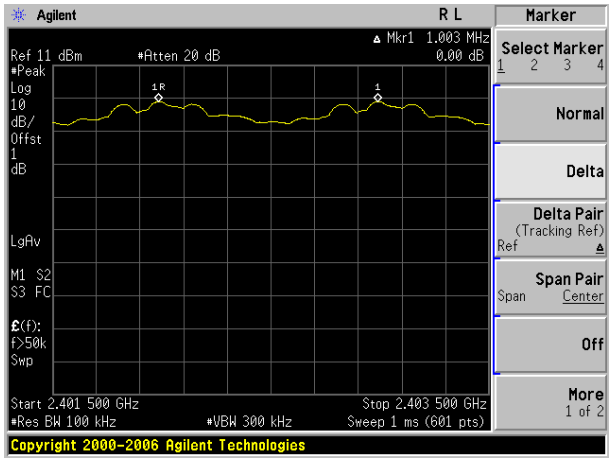


Middle channel

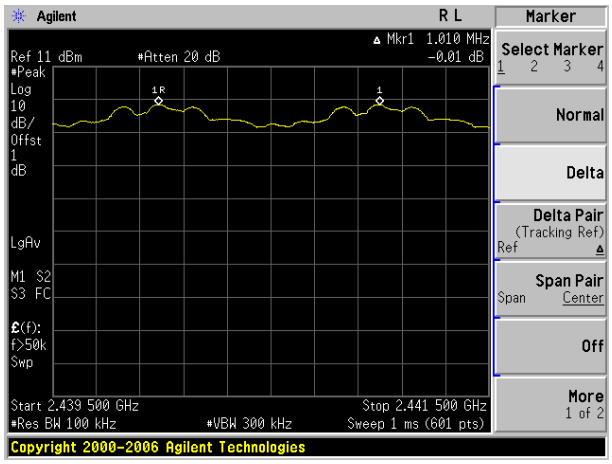


Highest channel

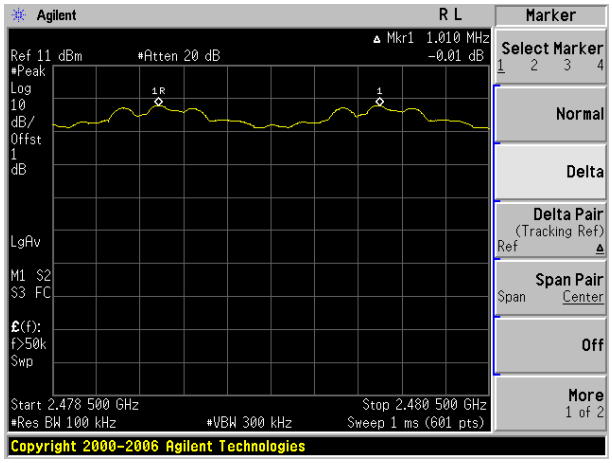
Modulation mode:	8DPSK



Lowest channel

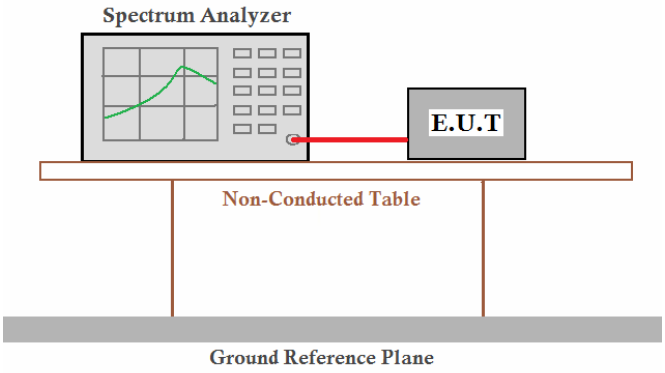


Middle channel



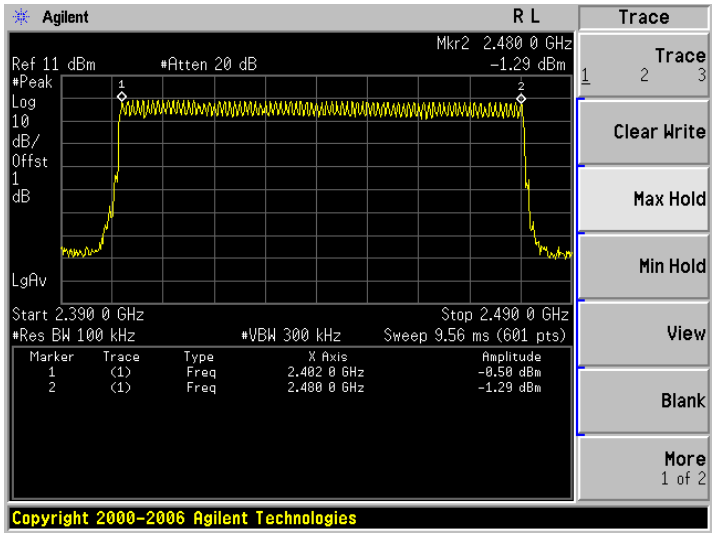
Highest channel

6.6 Hopping Channel Number

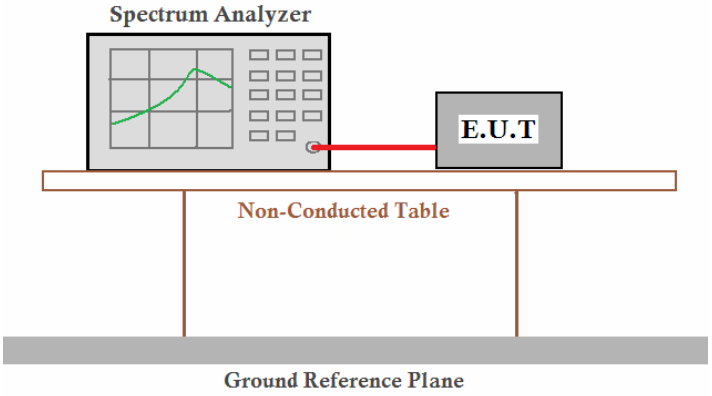
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, Frequency range=2400MHz-2483.5MHz, Detector=Peak
Limit:	15 channels
Test setup:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data:

Mode	Hopping channel numbers	Limit	Result
GFSK, Pi/4QPSK, 8DPSK	79	15	Pass



6.7 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 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Measurement Data

Mode	Packet	Dwell time (second)	Limit (second)	Result
GFSK	DH1	0.128	0.4	Pass
	DH3	0.264		
	DH5	0.309		
Pi/4QPSK	2-DH1	0.128	0.4	Pass
	2-DH3	0.264		
	2-DH5	0.309		
8DPSK	3-DH1	0.128	0.4	Pass
	3-DH3	0.264		
	3-DH5	0.309		

The test period: T= 0.4 Second/Channel x 79 Channel = 31.6 s

The lowest channel (2402MHz), middle channel (2441MHz), highest channel (2480MHz) as blow

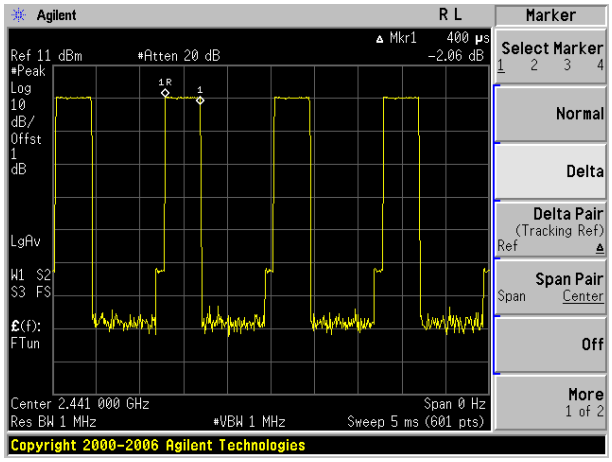
DH1 time slot=0.40(ms)*(1600/ (2*79))*31.6=128.00 ms

DH3 time slot=1.65(ms)*(1600/ (4*79))*31.6=264.00ms

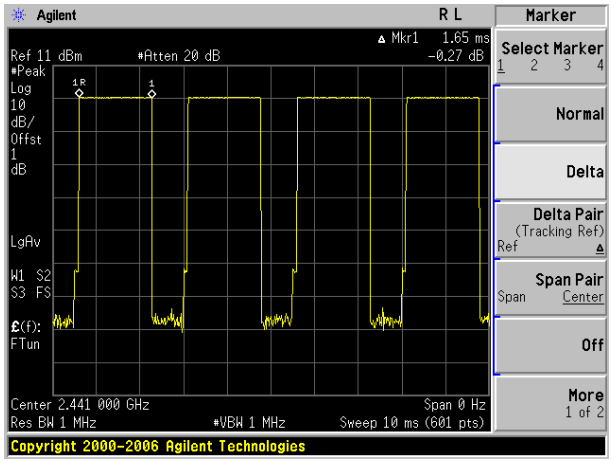
DH5 time slot=2.90(ms)*(1600/ (6*79))*31.6=309.33 ms

Test plot as follows:

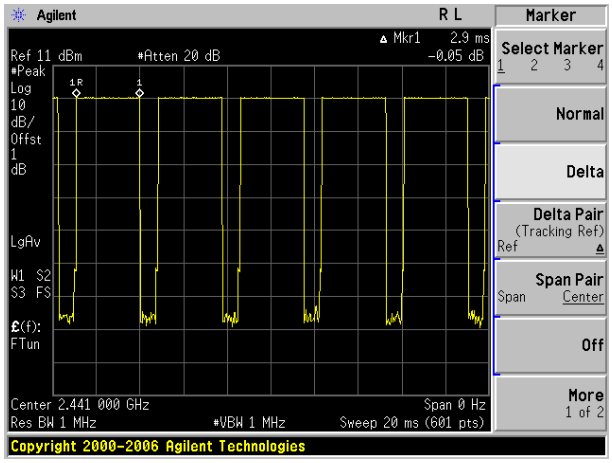
Modulation mode:	GFSK, Pi/4QPSK, 8DPSK



DH1, 2-DH1, 3-DH1



DH3, 2-DH3, 3-DH3



DH5, 2-DH5, 3-DH5

6.8 Pseudorandom Frequency Hopping Sequence

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

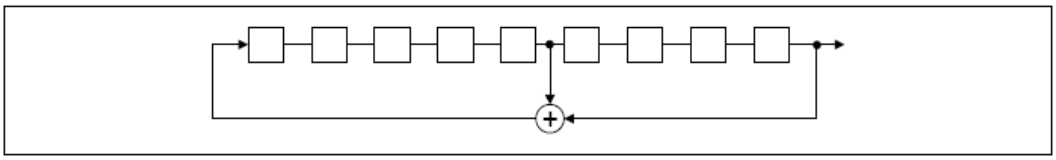
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

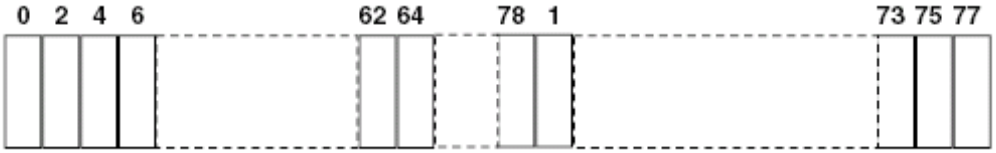
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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

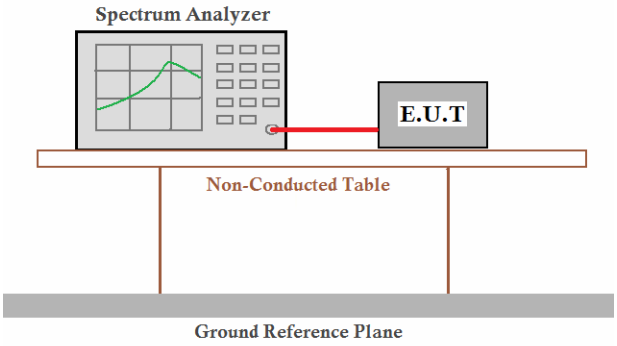


Each frequency used equally on the average by each transmitter.

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.

6.9 Band Edge

6.9.1 Conducted Emission Method

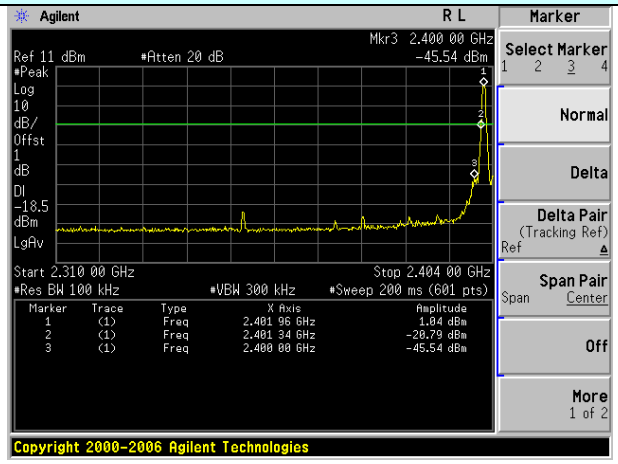
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003
Receiver setup:	RBW=100kHz, VBW=300kHz, Detector=Peak
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by 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:	
Test Instruments:	Refer to section 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:

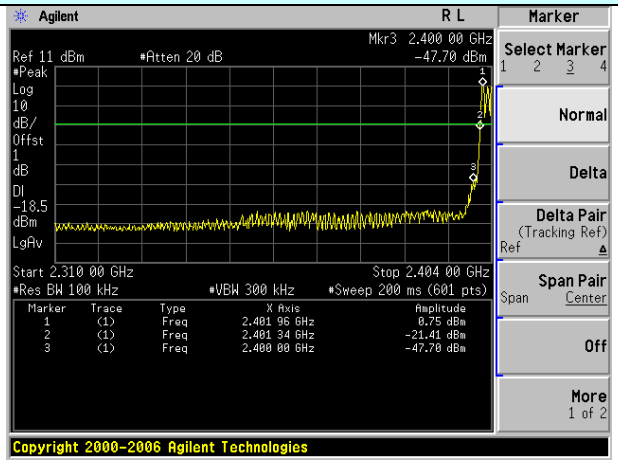
During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.

Test plot as follows:

Test channel:	Lowest channel

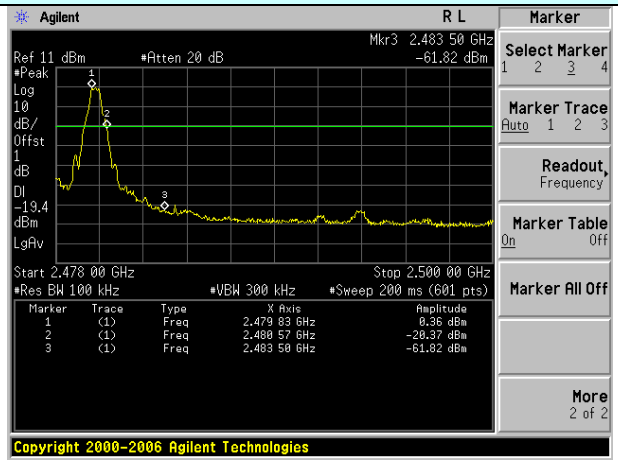


No-hopping mode

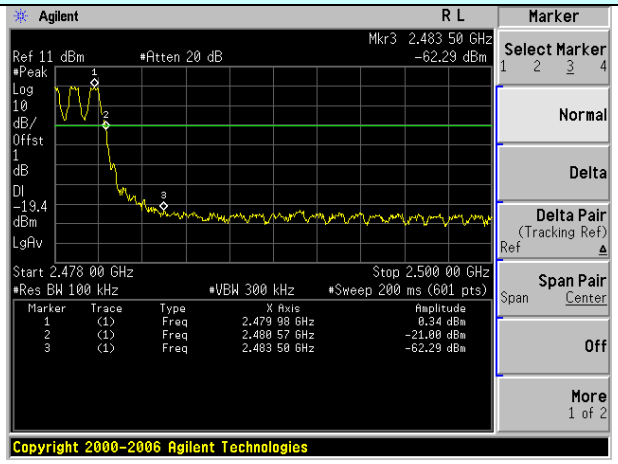


Hopping mode

Test channel:	Highest channel

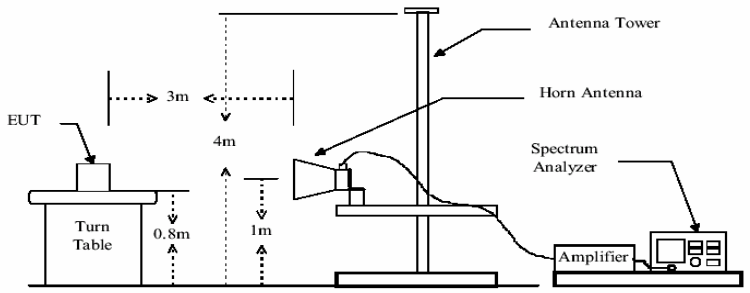


No-hopping mode



Hopping mode

6.9.2 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 Above 1GHz / AV / 1MHz / 10Hz / Average Value
Limit:	Frequency / Limit (dBuV/m @3m) / Remark Above 1GHz / 54.00 / Average Value Above 1GHz / 74.00 / Peak Value
Test setup:	
Test Procedure:	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 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:

1. *During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.*
2. *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)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2390.00	48.45	27.37	3.81	34.83	44.80	74.00	-29.20	Horizontal
2400.00	55.56	27.37	3.83	34.83	51.93	74.00	-22.07	Horizontal
2390.00	63.45	27.37	3.81	34.83	59.80	74.00	-14.20	Vertical
2400.00	65.53	27.37	3.83	34.83	61.90	74.00	-12.10	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	39.35	27.39	3.81	34.83	35.72	54.00	-18.28	Horizontal
2400.00	37.66	27.39	3.83	34.83	34.05	54.00	-19.95	Horizontal
2390.00	43.28	27.39	3.81	34.83	39.65	54.00	-14.35	Vertical
2400.00	42.58	27.39	3.83	34.83	38.97	54.00	-15.03	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	53.32	27.31	3.89	34.86	49.66	74.00	-24.34	Horizontal
2500.00	56.56	27.31	3.90	34.87	52.90	74.00	-21.10	Horizontal
2483.50	51.34	27.31	3.89	34.86	47.68	74.00	-26.32	Vertical
2500.00	54.97	27.31	3.90	34.87	51.31	74.00	-22.69	Vertical

Average value:

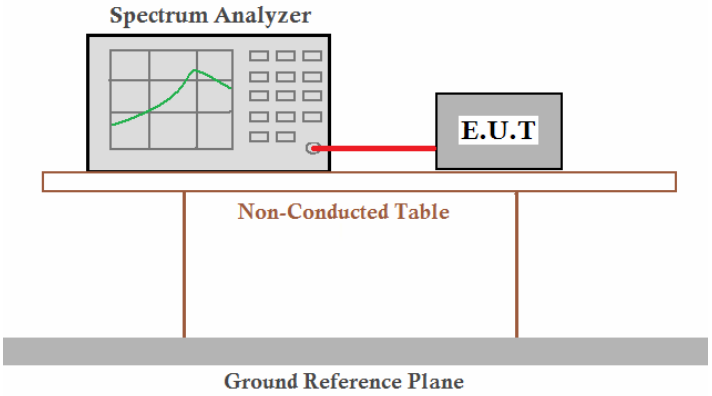
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2483.50	46.30	27.44	3.89	34.86	42.77	54.00	-11.23	Horizontal
2500.00	40.46	27.44	3.90	34.87	36.93	54.00	-17.07	Horizontal
2483.50	44.45	27.44	3.89	34.86	40.92	54.00	-13.08	Vertical
2500.00	37.92	27.44	3.90	34.87	34.39	54.00	-19.61	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.*

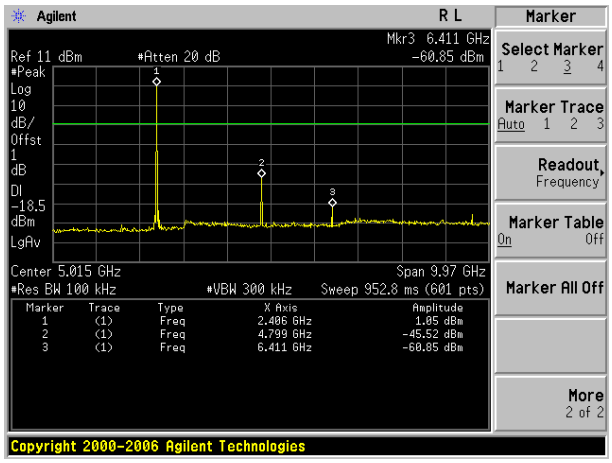
6.10 Spurious Emission

6.10.1 Conducted Emission Method

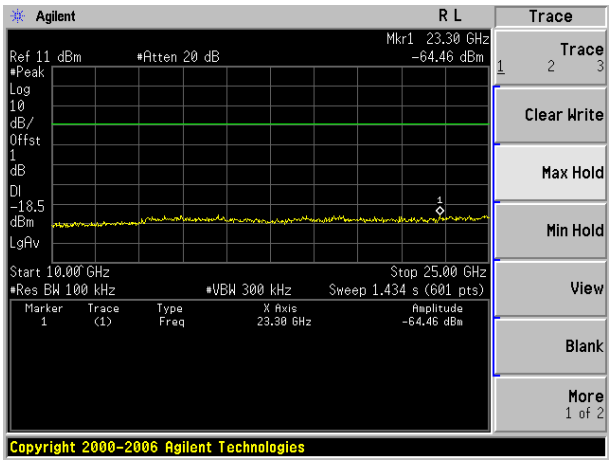
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and KDB558074 D01 Meas Guidance
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:
During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which it is worse case.

Test channel:	Lowest channel

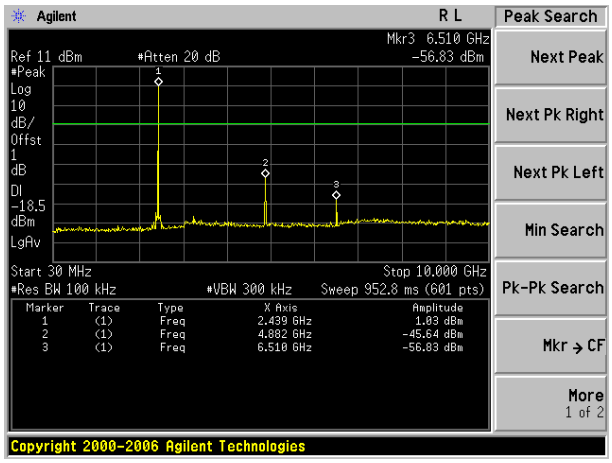


30MHz~10GHz

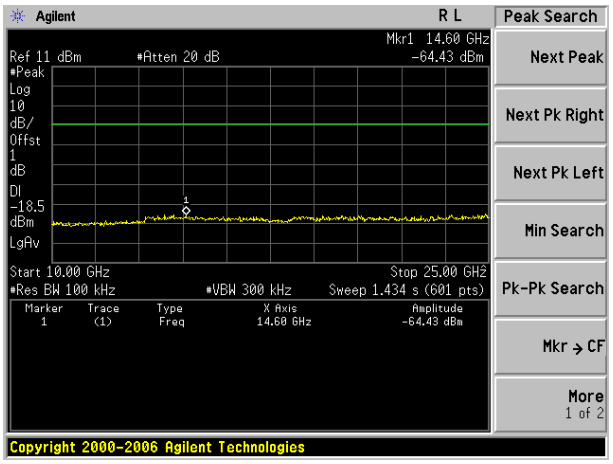


10GHz~25GHz

Test channel:	Middle channel

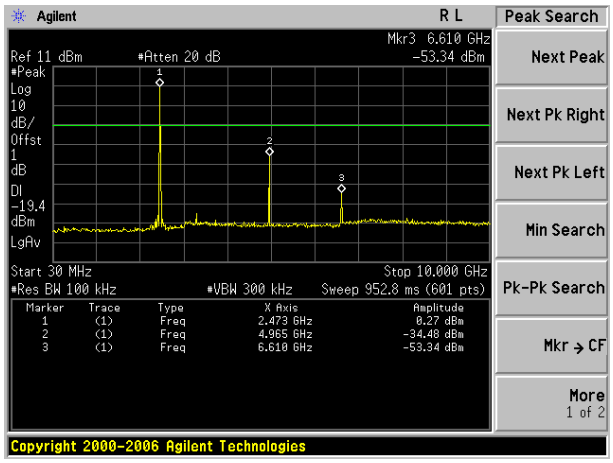


30MHz~10GHz

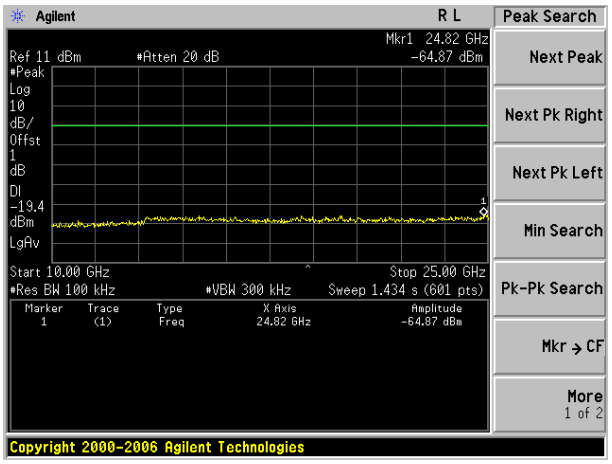


10GHz~25GHz

Test channel:	Highest channel



30MHz~10GHz



10GHz~25GHz

6.10.2 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:

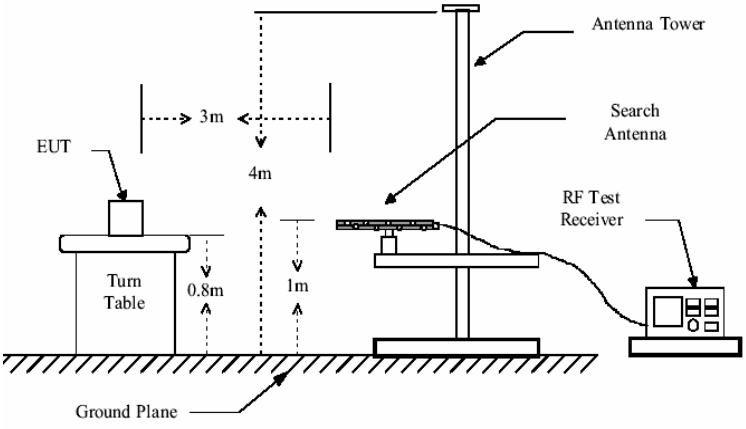
Frequency	Detector	RBW	VBW	Remark
30MHz-1GHz	Quasi-peak	120KHz	300KHz	Quasi-peak Value
Above 1GHz	Peak	1MHz	3MHz	Peak Value
	AV	1MHz	10Hz	Average Value

Limit:

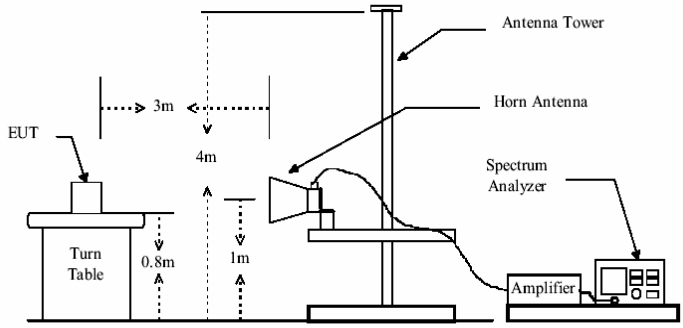
Frequency	Limit (dBuV/m @3m)	Remark
30MHz-88MHz	40.0	Quasi-peak Value
88MHz-216MHz	43.5	Quasi-peak Value
216MHz-960MHz	46.0	Quasi-peak Value
960MHz-1GHz	54.0	Quasi-peak Value
Above 1GHz	54.0	Average Value
	74.0	Peak Value

Test setup:

Below 1GHz



Above 1GHz



Test Procedure:	1. The EUT was placed on the top of a rotating table 0.8 meters 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 5.8 for details
Test mode:	Refer to section 5.3 for details
Test results:	Pass

Remark:

1. *During the test, pre-scan the GFSK, Pi/4QPSK, 8DPSK modulation, and found the GFSK modulation which is worse case.*
2. *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)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
34.88	49.85	15.82	0.61	32.06	34.22	40.00	-5.78	Vertical
54.07	43.91	16.15	0.81	31.95	28.92	40.00	-11.08	Vertical
113.32	48.30	14.15	1.31	31.83	31.93	43.50	-11.57	Vertical
234.17	44.50	14.88	2.04	32.16	29.26	46.00	-16.74	Vertical
742.26	39.23	22.34	4.24	31.25	34.56	46.00	-11.44	Vertical
925.76	40.00	23.99	4.95	31.20	37.74	46.00	-8.26	Vertical
34.28	48.66	15.80	0.60	32.06	33.00	40.00	-7.00	Horizontal
72.59	49.56	12.53	0.96	31.84	31.21	40.00	-8.79	Horizontal
96.44	47.85	16.02	1.16	31.75	33.28	43.50	-10.22	Horizontal
147.40	53.02	11.27	1.55	31.97	33.87	43.50	-9.63	Horizontal
239.15	41.95	15.06	2.06	32.16	26.91	46.00	-19.09	Horizontal
929.01	38.48	23.99	4.96	31.20	36.23	46.00	-9.77	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
4804.00	46.60	31.44	5.87	35.46	48.45	74.00	-25.55	Vertical
7206.00	52.82	36.38	7.08	35.32	60.96	74.00	-13.04	Vertical
9608.00	45.20	38.01	9.01	35.72	56.50	74.00	-17.50	Vertical
12010.00	*					74.00		Vertical
14412.00	*					74.00		Vertical
4804.00	45.28	31.44	5.87	35.46	47.13	74.00	-26.87	Horizontal
7206.00	48.74	36.38	7.08	35.32	56.88	74.00	-17.12	Horizontal
9608.00	43.40	38.01	9.01	35.72	54.70	74.00	-19.30	Horizontal
12010.00	*					74.00		Horizontal
14412.00	*					74.00		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
4804.00	26.35	31.42	5.87	35.46	28.18	54.00	-25.82	Vertical
7206.00	32.16	36.36	7.08	35.32	40.28	54.00	-13.72	Vertical
9608.00	29.38	37.99	9.01	35.72	40.66	54.00	-13.34	Vertical
12010.00	*					54.00		Vertical
14412.00	*					54.00		Vertical
4804.00	25.87	31.42	5.87	35.46	27.70	54.00	-26.30	Horizontal
7206.00	32.62	36.36	7.08	35.32	40.74	54.00	-13.26	Horizontal
9608.00	26.38	37.99	9.01	35.72	37.66	54.00	-16.34	Horizontal
12010.00	*					54.00		Horizontal
14412.00	*					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)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4882.00	45.44	31.48	5.91	35.48	47.35	74.00	-26.65	Vertical
7323.00	45.49	36.37	7.14	35.27	53.73	74.00	-20.27	Vertical
9764.00	46.97	38.35	9.06	35.75	58.63	74.00	-15.37	Vertical
12205.00	*					74.00		Vertical
14646.00	*					74.00		Vertical
4882.00	44.03	31.48	5.91	35.48	45.94	74.00	-28.06	Horizontal
7323.00	44.26	36.37	7.14	35.27	52.50	74.00	-21.50	Horizontal
9764.00	45.97	38.35	9.06	35.75	57.63	74.00	-16.37	Horizontal
12205.00	*					74.00		Horizontal
14646.00	*					74.00		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
4882.00	28.35	31.46	5.91	35.48	30.24	54.00	-23.76	Vertical
7323.00	29.57	36.35	7.14	35.27	37.79	54.00	-16.21	Vertical
9764.00	29.32	38.33	9.06	35.75	40.96	54.00	-13.04	Vertical
12205.00	*					54.00		Vertical
14646.00	*					54.00		Vertical
4882.00	26.35	31.46	5.91	35.48	28.24	54.00	-25.76	Horizontal
7323.00	27.32	36.35	7.14	35.27	35.54	54.00	-18.46	Horizontal
9764.00	31.25	38.33	9.06	35.75	42.89	54.00	-11.11	Horizontal
12205.00	*					54.00		Horizontal
14646.00	*					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

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
4960.00	45.68	31.58	5.97	35.49	47.74	74.00	-26.26	Vertical
7440.00	46.41	36.49	7.18	35.23	54.85	74.00	-19.15	Vertical
9920.00	45.61	38.55	9.11	35.78	57.49	74.00	-16.51	Vertical
12400.00	*					74.00		Vertical
14880.00	*					74.00		Vertical
4960.00	44.87	31.58	5.97	35.49	46.93	74.00	-27.07	Horizontal
7440.00	45.47	36.49	7.18	35.23	53.91	74.00	-20.09	Horizontal
9920.00	44.57	38.55	9.11	35.78	56.45	74.00	-17.55	Horizontal
12400.00	*					74.00		Horizontal
14880.00	*					74.00		Horizontal

Average value:

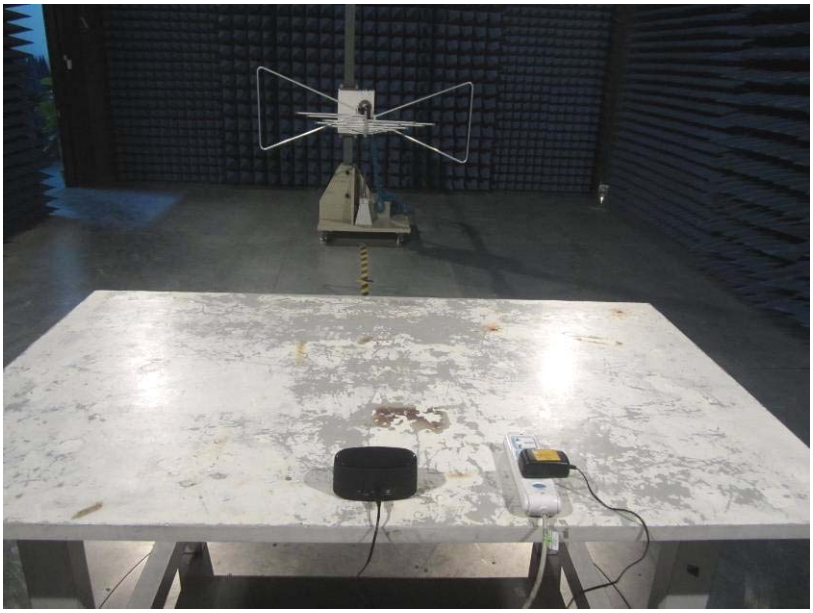
Frequency (MHz)	Read Level (dBuV)	Antenna Factor (dB/m)	Cable Loss (dB)	Preamp Factor (dB)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
4960.00	28.16	31.59	5.97	35.49	30.23	54.00	-23.77	Vertical
7440.00	32.26	36.50	7.18	35.23	40.71	54.00	-13.29	Vertical
9920.00	29.46	38.56	9.11	35.78	41.35	54.00	-12.65	Vertical
12400.00	*					54.00		Vertical
14880.00	*					54.00		Vertical
4960.00	25.26	31.59	5.97	35.49	27.33	54.00	-26.67	Horizontal
7440.00	31.20	36.50	7.18	35.23	39.65	54.00	-14.35	Horizontal
9920.00	26.35	38.56	9.11	35.78	38.24	54.00	-15.76	Horizontal
12400.00	*					54.00		Horizontal
14880.00	*					54.00		Horizontal

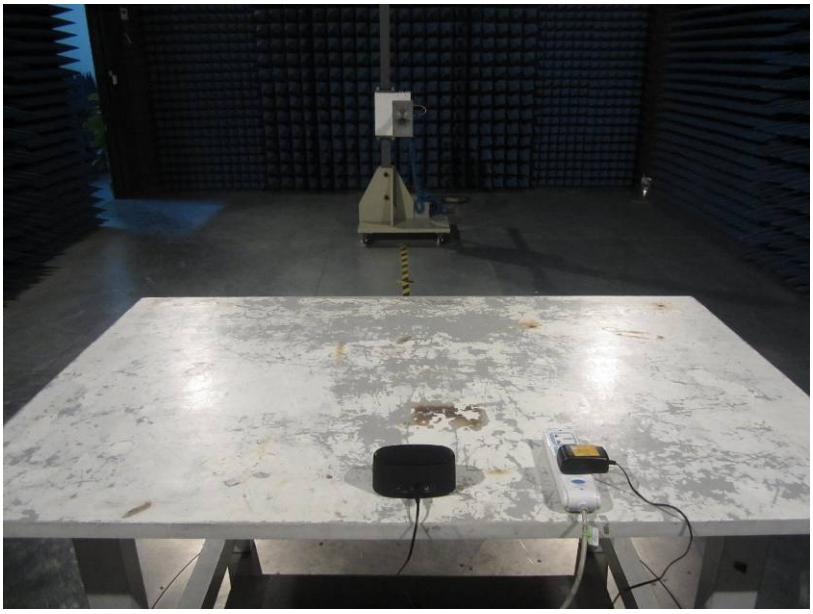
Remark:

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.*

7 Test Setup Photo

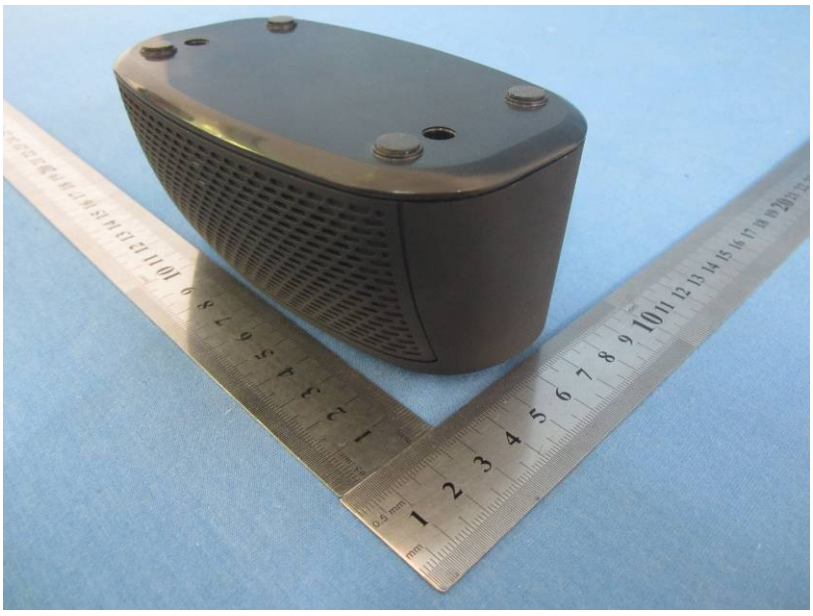
Radiated Emission

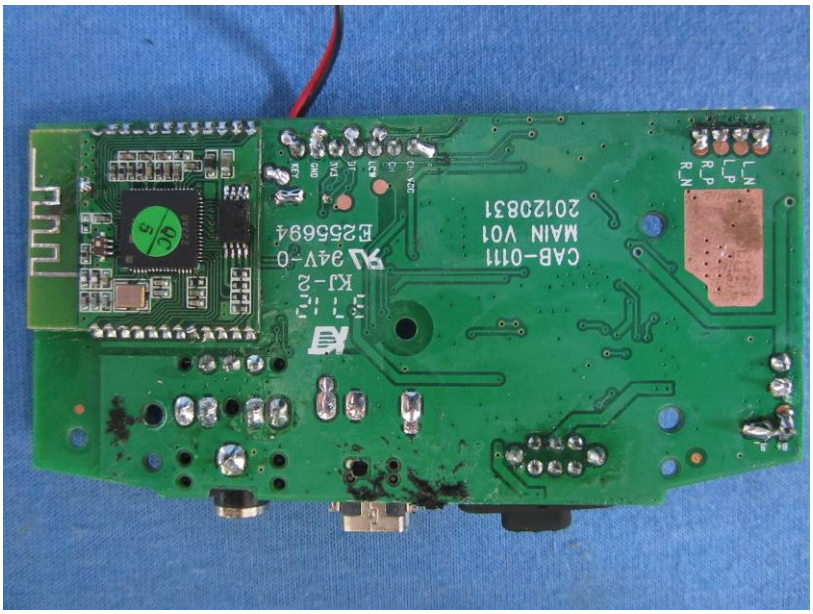




Conducted Emission

8 EUT Constructional Details

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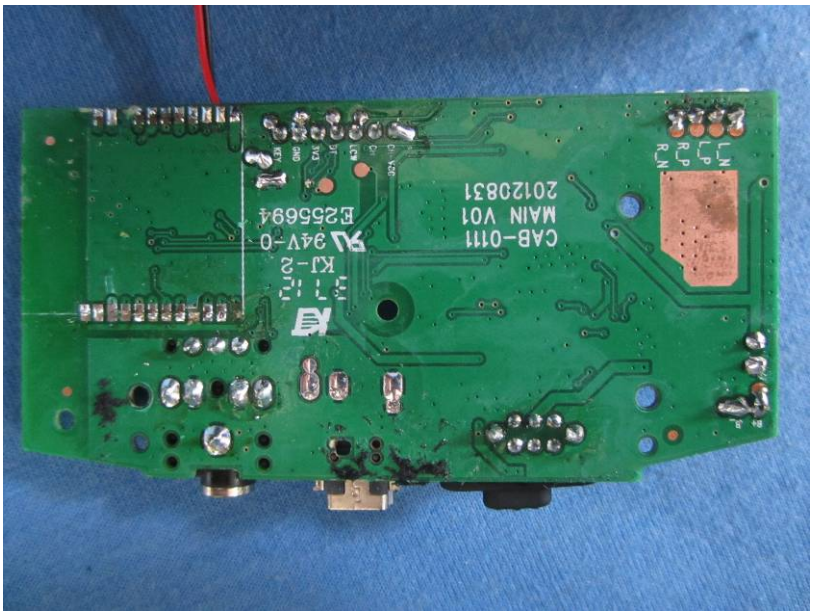
20120831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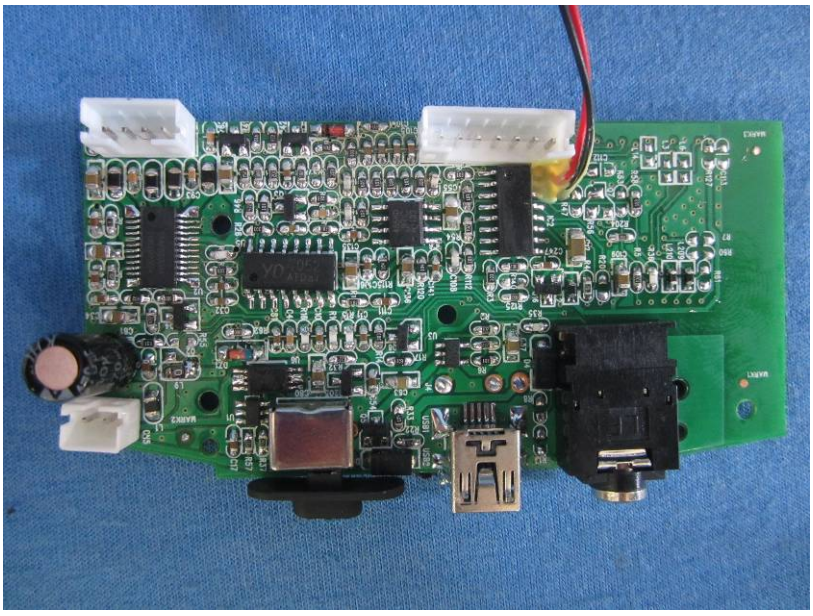

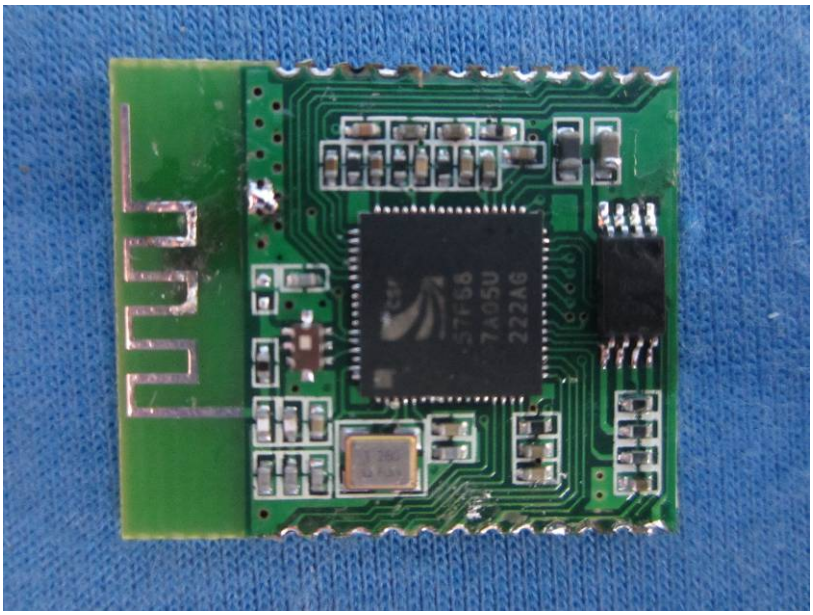

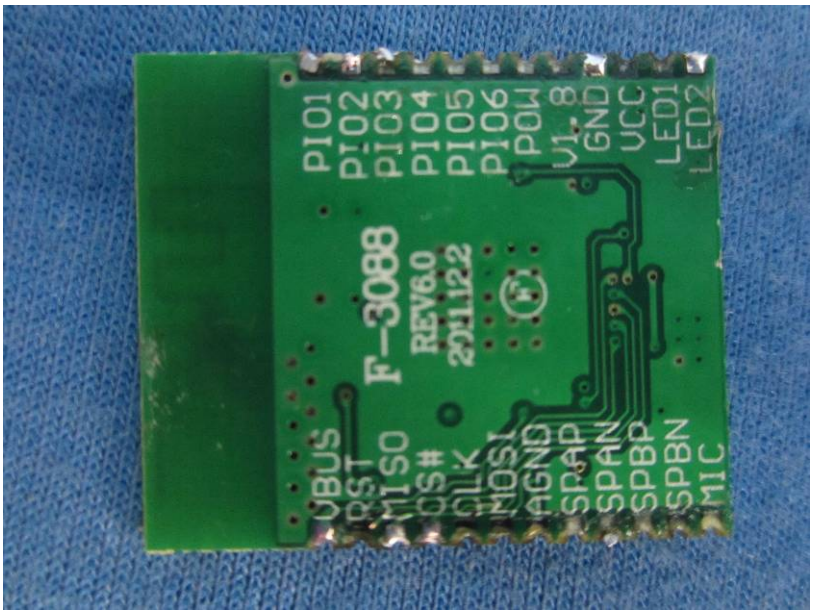
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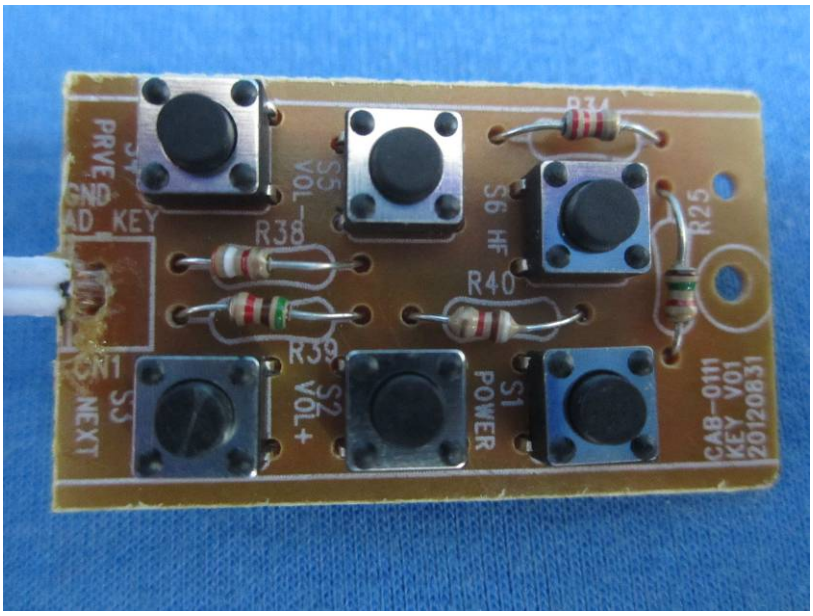
PI02
PI03
PI04
PI05
PI06
POW
V1.8
GND
VCC
LED1
LED2
F-3088
REV6.0
2011.12.2
VBUS
RST
MISO
CS#
CLK
MOSI
AGND
SPAP
SPAN
SPBP
SPBN
MIC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AD KEY
R38
S5
VOL-
S6 HF
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R39
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S3
NEXT
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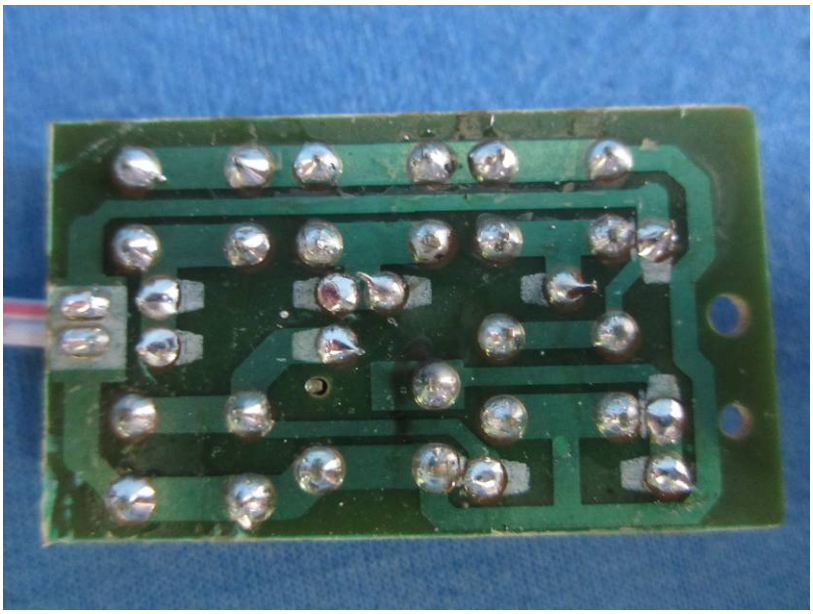
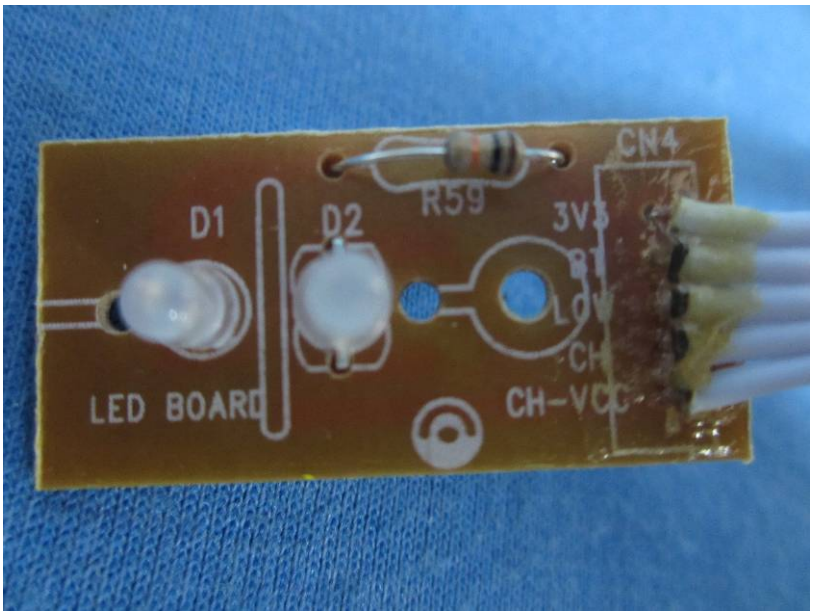
POWER
CAB-0111
KEY V01
20120831

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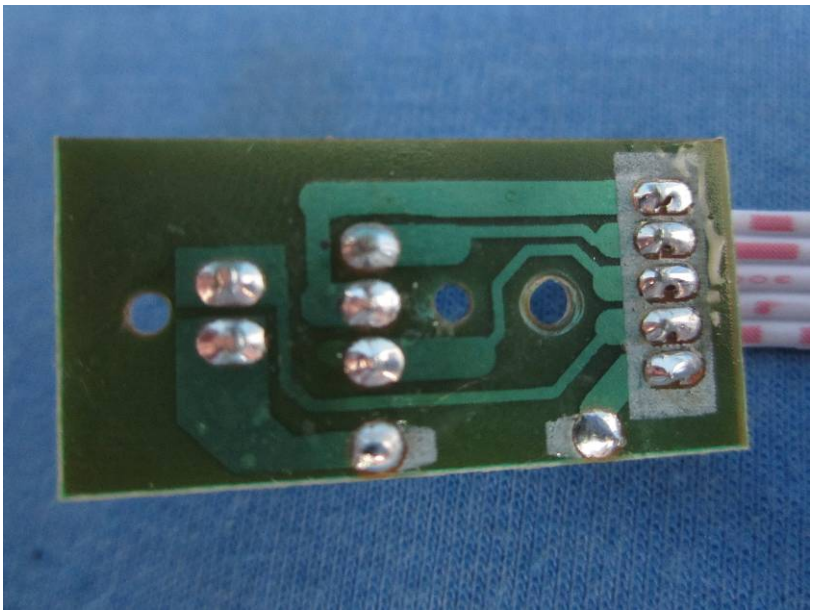
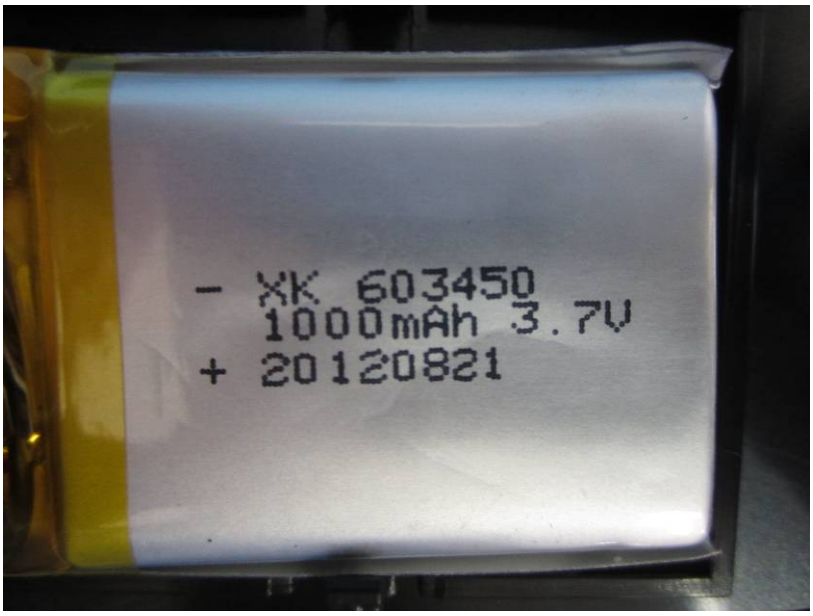
D2
R59
CN4
3V3
LED BOARD
CH-VCC




- XK 603450
1000mAh 3.7V
+ 20120821


Swtec AC ADAPTER
MODEL:SW018S050250U1
INPUT:100-240V~50/60Hz 0.5A
OUTPUT:5.0V 2.5A
LPS
LISTED
Tested To Comply with FCC Standards
I.T.E power supply
EFFICIENCY LEVEL
MADE IN CHINA

------end------