SGS-CSTC Standards Technical Services Ltd.

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FCC REPORT

Application No:	SZEMO091005749RF
Applicant:	CHIN FAI ELECTRONICS COMPANY
Product Name:	SILICON BLUETOOTH KEYBOARD
Operation Frequency:	2.402GHz to 2.480GHz
FCC ID:	XJ4KB6113
Standards:	FCC CFR Title 47 Part 15 Subpart C Section 15.247: 2008
Date of Receipt:	10 October 2009
Date of Test:	10 October to 04 December 2009
Date of Issue:	07 December 2009
Test Result :	**PASS ***

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

Authorized Signature:

Robinson Lo
Manager

The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report. If the product in this report is used in any configuration other than that detailed in the report, the manufacturer must ensure the new system complies with all relevant standards. Any mention of SGS International Electrical Approvals or testing done by SGS International Electrical Approvals in connection with, distribution or use of the product described in this report must be approved by SGS International Electrical Approvals in writing.
The report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the federal government. All test results in this report can be traceable to National or International Standards.

2 Contents

3 Test Summary

Test Item	Section in CFR 47	Result
Antenna Requirement	15.203/15.247 (c)	Passed
AC Power Line Conducted Emission	15.207	Passed
Conducted Peak Output Power	15.247 (b)(1)	Passed
20dB Occupied Bandwidth	15.247 (a)(1)	Passed
Carrier Frequencies Separation	15.247 (a)(1)	Passed
Hopping Channel Number	15.247 (b)	Passed
Dwell Time	15.247 (a)(1)	Passed
Pseudorandom Frequency Hopping Sequence	15.247(b)(4)&TCB Exclusion List (7 July 2002)	Passed
Radiated Emission	15.205/15.209/15.247	Passed
Band Edge	15.247(d)	Passed
RF Antenna Conducted spurious emissions	15.247(d)	Passed

Remark: Passed: The EUT complies with the essential requirements in the standard.
Failed: The EUT does not comply with the essential requirements in the standard.

4 General Information

4.1 Client Information

Applicant:	CHIN FAI ELECTRONICS COMPANY
Address of Applicant:	Building2c 2d, yingfeng industrial park, sanhe economic development zone huiyang district Huizhou city
Manufacturer/ Factory:	CHIN FAI ELECTRONICS COMPANY
Address of Manufacturer/ Factory:	Building2c 2d, yingfeng industrial park, sanhe economic development zone huiyang district Huizhou city

4.2 General Description of E.U.T.

Product Name:	SILICON BLUETOOTH KEYBOARD
Trade Name:	ETAU 臻辉
Item No.:	KB-6113, KB-6120, KB-6121, KB-6122, KB-6123, KB-6124, KB-6125, KB-6126, KB-6127, KB-6128, KB-6129
Operation Frequency:	2402MHz~2480MHz
Channel numbers:	79
Channel separation:	1MHz
Modulation type:	GFSK
Antenna Type:	Integral
Antenna gain:	0dBi
Power supply:	keyboard: Lithium=3.7V

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

4.3 E.U.T Operation mode

Operating Environment:	
Temperature:	24.0 °C
Humidity:	52 % RH
Atmospheric Pressure:	1008 mbar
Test mode:	
Bluetooth mode ;	Bluetooth mode: Keep the EUT connected to PC and exchange data
Charge mode:	Charge mode: Keep PC supply power to EUT, meanwhile, Keep EUT connected to PC and exchange data
Transmitting mode:	Keep the EUT in transmitting mode with modulation.

4.4 Test Facility

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

CNAS (No. CNAS L2929)

CNAS has accredited SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch EMC Lab to ISO/IEC 17025:2005 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.

VCCI

The 3m Semi-anechoic chamber and Shielded Room (7.5m x 4.0m x 3.0m) of SGS-CSTC Standards Technical Services Co., Ltd. have been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-2197 and C-2383 respectively.

Date of Registration: September 29, 2008. Valid until September 28, 2011.

FCC – Registration No.: 556682

SGS-CSTC Standards Technical 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 our files. Registration 556682, June 27, 2008.

Industry Canada (IC)

The 3m Semi-anechoic chamber of SGS-CSTC Standards Technical Services Co., Ltd. has been registered by Certification and Engineering Bureau of Industry Canada for radio equipment testing with Registration No.: 4620C-1.

4.5 Test Location

All tests were performed at:

SGS-CSTC Standards Technical Services Co., Ltd. Shenzhen Branch E&E Lab

No. 1 Workshop, M-10, Middle section, Science & Technology Park, Shenzhen, Guangdong, China 518057

Telephone: +86 (0) 755 2601 2053 Fax: +86 (0) 755 2671 0594

No tests were sub-contracted.

4.6 Other Information Requested by the Customer

None.

4.7 Test Instruments list

RE in Chamber						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	3m Semi-Anechoic Chamber	ETS-LINDGREN	N/A	SEL0017	16-06-2009	15-06-2010
2	EMI Test Receiver	Rohde & Schwarz	ESIB26	SEL0023	12-12-2009	11-12-2010
3	EMI Test software	AUDIX	E3	SEL0050	N/A	N/A
4	Coaxial cable	SGS	N/A	SEL0028	18-06-2009	17-06-2010
6	BiConiLog Antenna (26-3000MHz)	ETS-LINDGREN	3142C	SEL0014	12-08-2009	11-08-2010
7	Double-ridged horn (1-18GHz)	ETS-LINDGREN	3117	SEL0005	12-08-2009	11-08-2010
8	Horn Antenna (18-26GHz)	ETS-LINDGREN	3160	SEL0076	12-08-2009	11-08-2010
9	Pre-amplifier (0.1-1300MHz)	Agilent Technologies	8447D	SEL0053	18-06-2009	17-06-2010
10	Pre-amplifier (1-18GHz)	Rohde & Schwarz	AFS42-00101 800-25-S-42	SEL0081	18-06-2009	17-06-2010
11	Pre-amplifier (18-26GHz)	Rohde & Schwarz	AFS33-18002 650-30-8P-44	SEL0080	18-06-2009	17-06-2010
12	Band filter	Amindeon	82346	SEL0094	18-06-2009	17-06-2010

Conducted Emission						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	Shielding Room	ZhongYu Electron	GB-88	SEL0042	N/A	N/A
2	LISN	ETS-LINDGREN	3816/2	SEL0021	18-06-2009	17-06-2010
3	EMI Test Receiver	Rohde & Schwarz	ESCI	SEL0022	18-06-2009	17-06-2010
4	Coaxial Cable	SGS	N/A	SEL0024	18-06-2009	17-06-2010

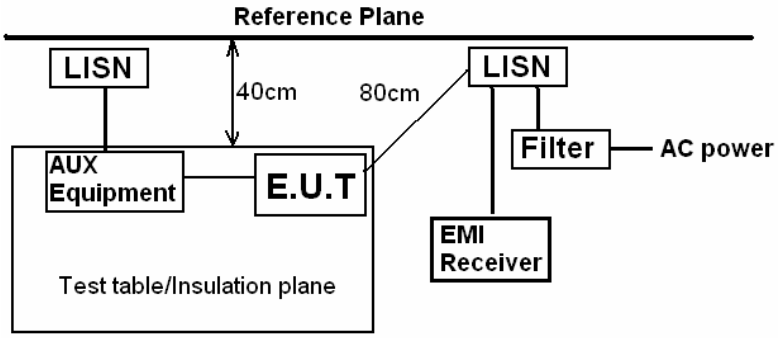
RF conducted						
Item	**Test Equipment**	**Manufacturer**	**Model No.**	**Inventory No.**	**Cal.Date (dd-mm-yy)**	**Cal.Due date (dd-mm-yy)**
1	Spectrum Analyzer	Rohde & Schwarz	10336/030	EMC0040	16-06-2009	15-06-2010
2	Coaxial cable	SGS	N/A	SEL0029	18-06-2009	17-06-2010

5 Test results and Measurement Data

5.1 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 integrated on the main PCB and no consideration of replacement. The best case gain of the antenna is 0dBi.	

5.2 Conducted Emissions

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.207</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2003</td></tr>
<tr><td>Test Frequency Range:</td><td>150KHz to 30MHz</td></tr>
<tr><td>Class / Severity:</td><td>Class B</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td rowspan="2">Frequency range (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>Quasi-peak</td><td>Average</td></tr>
<tr><td>0.15-0.5</td><td>66 to 56*</td><td>56 to 46*</td></tr>
<tr><td>0.5-5</td><td>56</td><td>46</td></tr>
<tr><td>5-30</td><td>60</td><td>50</td></tr>
</table>
* Decreases with the logarithm of the frequency.
</td></tr>
<tr><td>Test procedure</td><td>The E.U.T and simulators are connected to the main power through a line impedance stabilization network (L.I.S.N.). The provider a 50ohm/50uH coupling impedance for the measuring equipment. 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). 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.</td></tr>
<tr><td>Test setup:</td><td> 

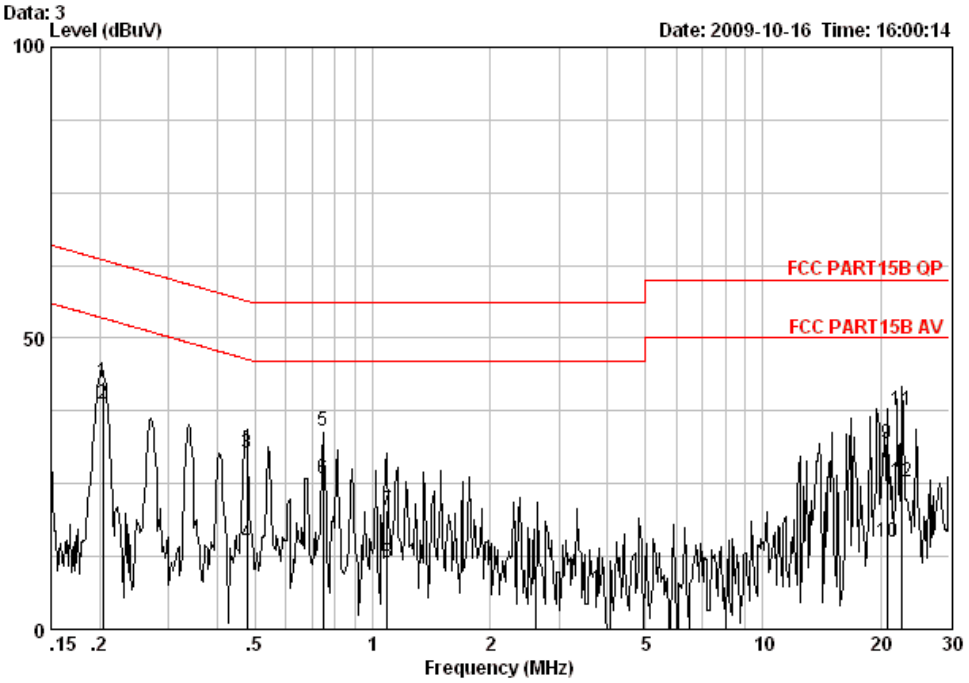
Remark:
E.U.T: Equipment Under Test
LISN: Line Impedence Stabilization Network
Test table height=0.8m</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 4.7 for details</td></tr>
<tr><td>Test mode:</td><td>Bluetooth mode</td></tr>
<tr><td>Test results:</td><td>Passed</td></tr>
</table>

Measurement Data

An initial pre-scan was performed on the live and neutral lines with peak detector.

Quasi-Peak and Average measurement were performed at the frequencies with maximized peak emission were detected.

Live line:



Site : Shielding Room
Condition : FCC PART15B QP CE LINE
EUT : SILICON BLUETOOTH KEYBOARD
Test No. : 5749RF
Mode : BLUETOOTH

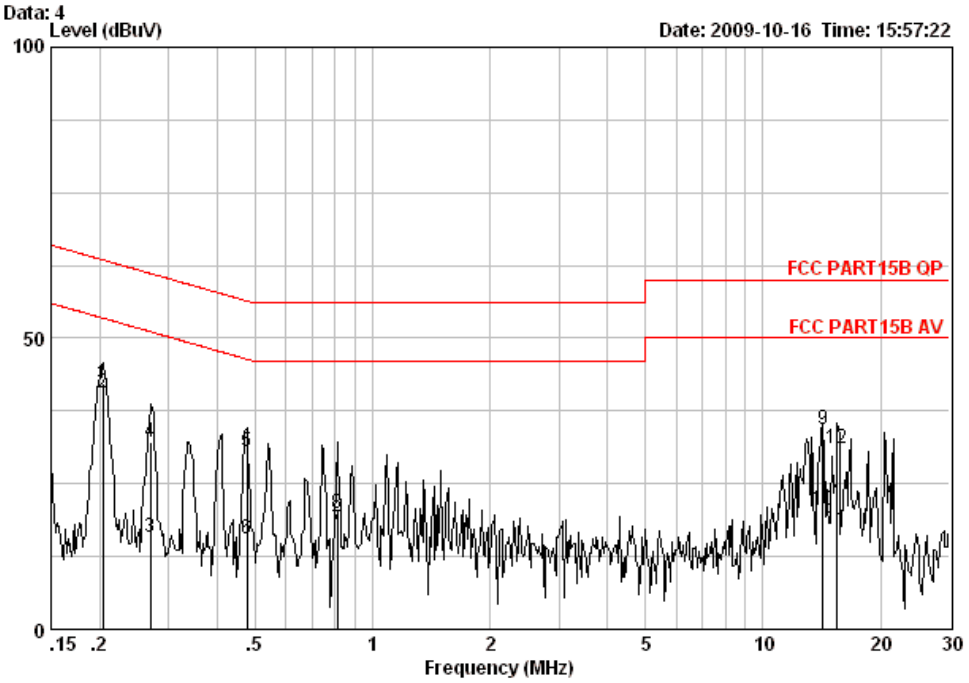
		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.20396	0.04	-0.04	42.40	42.40	63.45	-21.05	QP
2		0.20396	0.04	-0.04	38.70	38.70	53.45	-14.75	Average
3		0.47612	0.06	-0.04	30.20	30.22	56.41	-26.19	QP
4		0.47612	0.06	-0.04	14.70	14.72	46.41	-31.69	Average
5	@	0.74690	0.06	-0.05	34.10	34.12	46.00	-11.88	Average
6		0.74690	0.06	-0.05	25.90	25.92	56.00	-30.08	QP
7		1.088	0.08	-0.05	20.40	20.43	56.00	-35.57	QP
8		1.088	0.08	-0.05	11.50	11.53	46.00	-34.47	Average
9		20.814	0.27	-0.67	32.20	31.81	60.00	-28.19	QP
10		20.814	0.27	-0.67	15.30	14.91	50.00	-35.09	Average
11		22.660	0.28	-0.71	38.10	37.67	60.00	-22.33	QP
12		22.660	0.28	-0.71	25.90	25.47	50.00	-24.53	Average

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

Neutral line:



Site : Shielding Room
Condition : FCC PART15B QP CE NEUTRAL
EUT : SILICON BLUETOOTH KEYBOARD
Test No. : 5749RF
Mode : BLUETOOTH

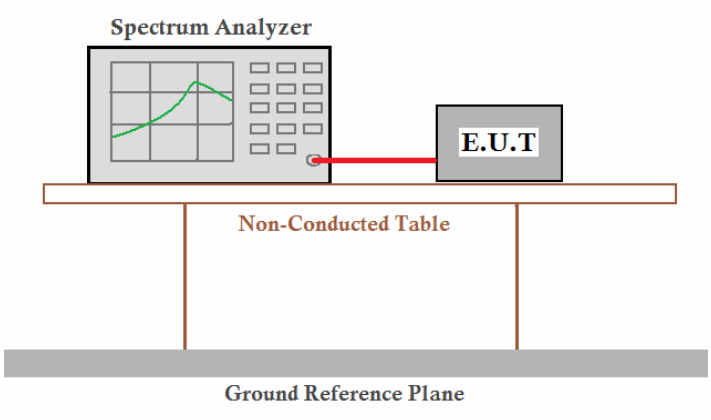
		Freq	Cable Loss	LISN Factor	Read Level	Level	Limit Line	Over Limit	Remark
		MHz	dB	dB	dBuV	dBuV	dBuV	dB	
1		0.20396	0.04	-0.04	42.10	42.10	63.45	-21.35	QP
2	@	0.20396	0.04	-0.04	40.50	40.50	53.45	-12.95	Average
3		0.27009	0.05	-0.04	15.90	15.91	51.12	-35.21	Average
4		0.27009	0.05	-0.04	32.10	32.11	61.12	-29.01	QP
5		0.47612	0.06	-0.04	30.50	30.52	56.41	-25.89	QP
6		0.47612	0.06	-0.04	15.60	15.62	46.41	-30.79	Average
7		0.81300	0.07	-0.04	17.20	17.23	46.00	-28.77	Average
8		0.81300	0.07	-0.04	20.00	20.03	56.00	-35.97	QP
9		14.210	0.25	-0.44	34.40	34.21	60.00	-25.79	QP
10		14.210	0.25	-0.44	20.70	20.51	50.00	-29.49	Average
11		15.470	0.25	-0.48	17.30	17.07	50.00	-32.93	Average
12		15.470	0.25	-0.48	31.20	30.97	60.00	-29.03	QP

Notes:

1. The following Quasi-Peak and Average measurements were performed on the EUT:

2. Final Test Level =Receiver Reading + LISN Factor + Cable Loss.

5.3 Conducted Peak Output Power

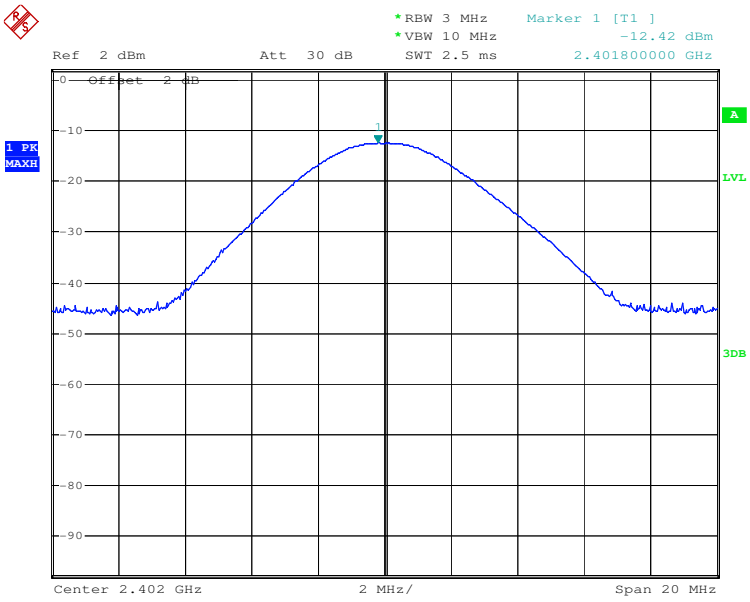
Test Requirement:	FCC Part15 C Section 15.247 (b)(1)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Limit:	30dBm
Test setup:	 *Remark:* *Offset the High-Frequency cable loss 2.0 dB in the spectrum analyzer.*
Test Instruments:	Refer to section 4.7 for details
Test state:	Non-hopping transmitting with modulation.
Test results:	Passed

Measurement Data

GFSK mode			
Test channel	Peak Output Power (dBm)	Limit (dBm)	Result
Lowest	-12.42	30.00	Pass
Middle	-11.14	30.00	Pass
Highest	-10.01	30.00	Pass

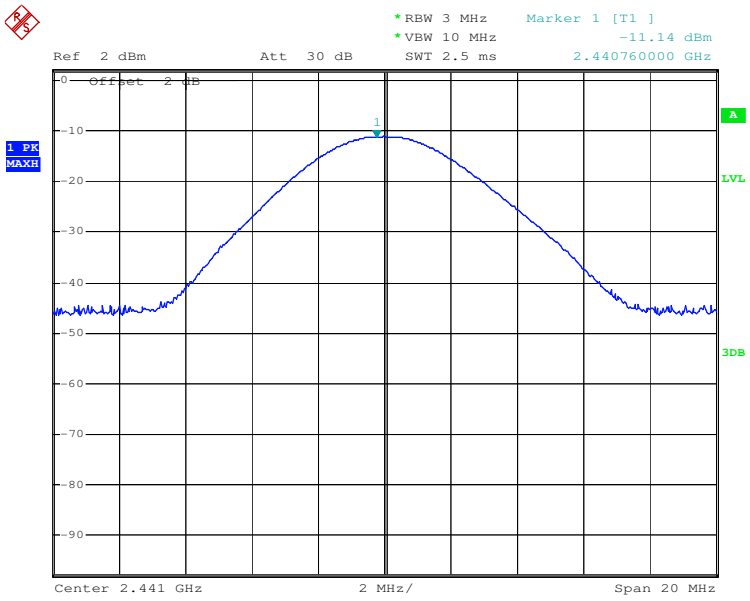
Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest



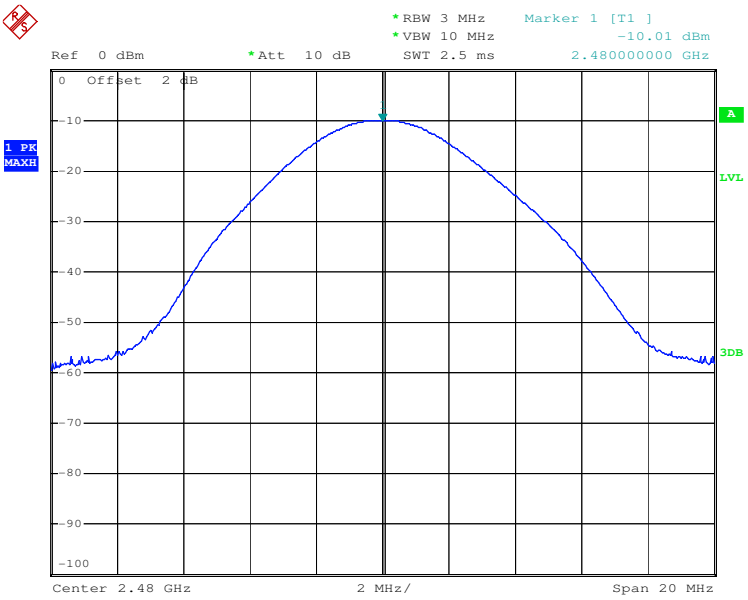
Date: 14.OCT.2009 22:49:24

Test mode:	GFSK	Test channel:	Middle



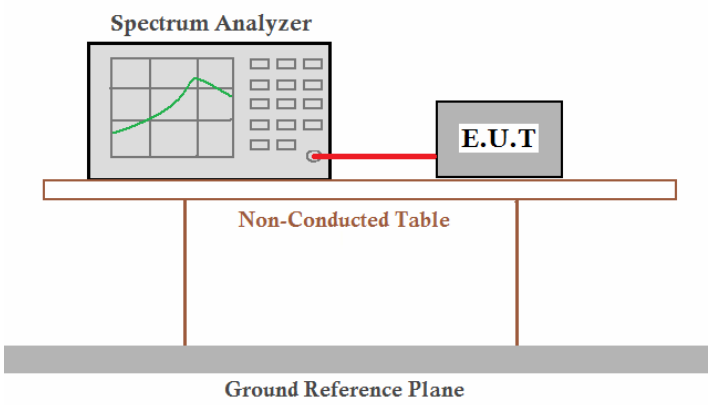
Date: 14.OCT.2009 22:52:47

Test mode:	GFSK	Test channel:	Highest



Date: 15.OCT.2009 04:19:54

5.4 20dB Occupy Bandwidth

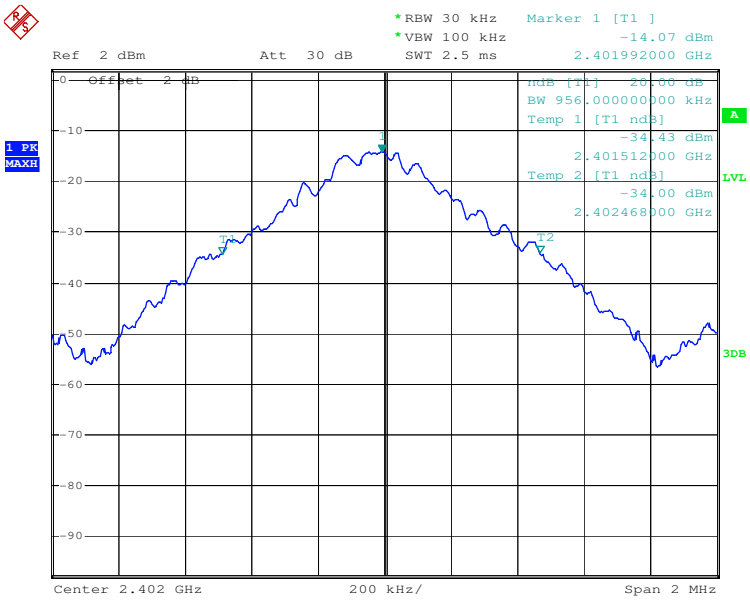
Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Limit:	NA
Test setup:	
Test Instruments:	Refer to section 4.7 for details
Test state:	Non-hopping transmitting with modulation.
Test results:	Passed

Measurement Data

20dB Occupy Bandwidth (KHz)		
Lowest	Middle	Highest
956	964	968

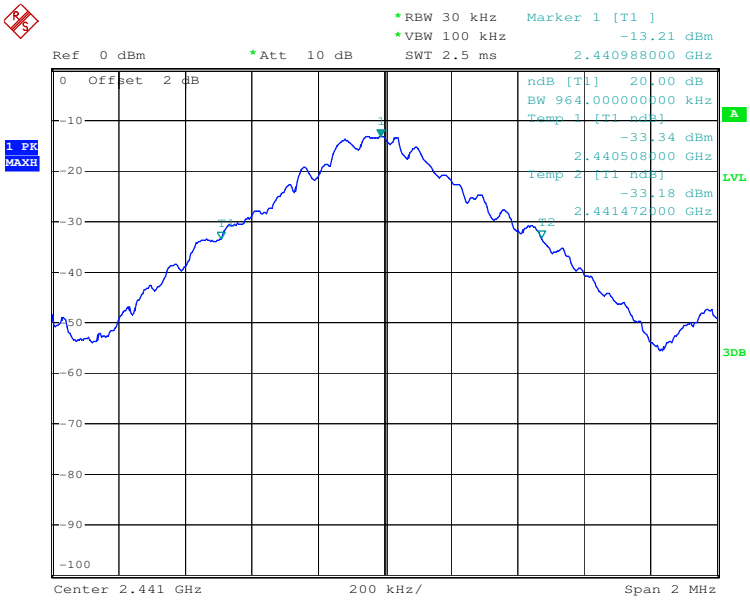
Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest



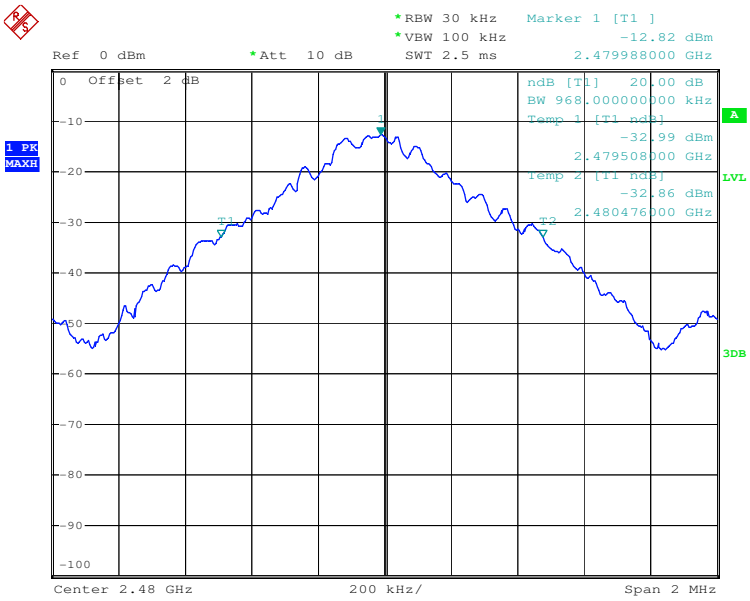
Date: 15.OCT.2009 02:52:15

Test mode:	GFSK	Test channel:	Middle



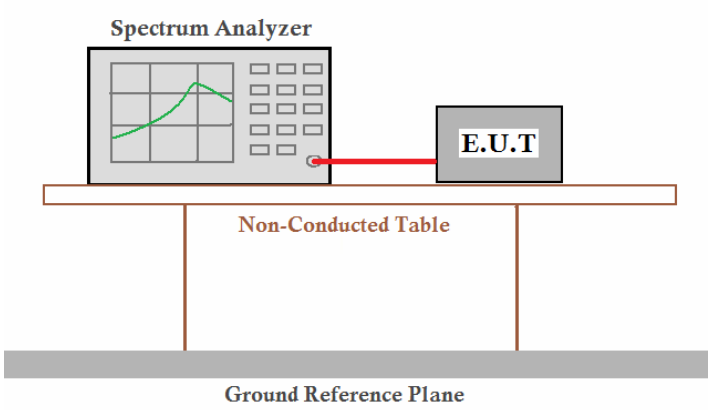
Date: 15.OCT.2009 03:51:36

Test mode:	GFSK	Test channel:	Highest



Date: 15.OCT.2009 04:20:31

5.5 Carrier Frequencies Separation

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Test setup:	
Test Instruments:	Refer to section 4.7 for details
Limit:	0.025MHz or 2/3 of the 20dB bandwidth (whichever is greater)
Test state:	Hopping transmitting with modulation.
Test results:	Passed

Measurement Data

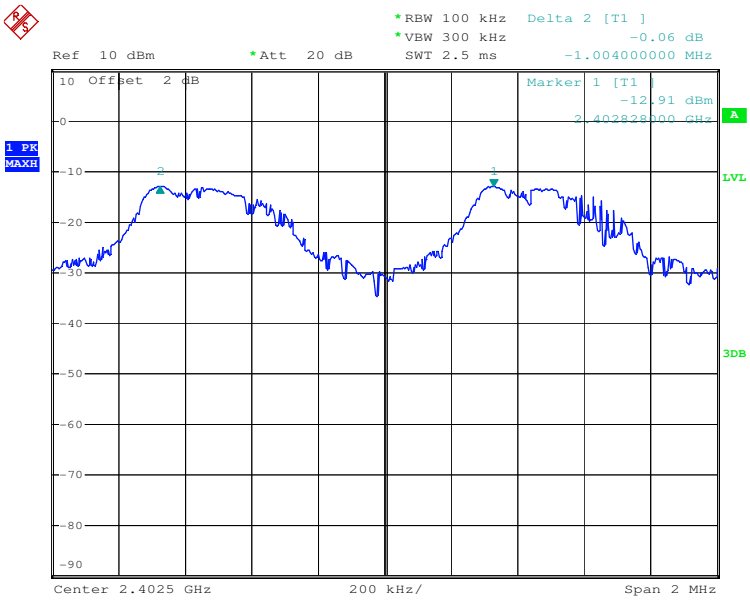
GFSK mode			
Test channel	Carrier Frequencies Separation (KHz)	Limit (KHz)	Result
Lowest	1004	645	Pass
Middle	1004	645	Pass
Highest	1008	645	Pass

Note: According to section 5.4

Mode	*20dB bandwidth (KHz) (worse case)*	*Limit (KHz) (Carrier Frequencies Separation)*
GFSK	*968*	*645*

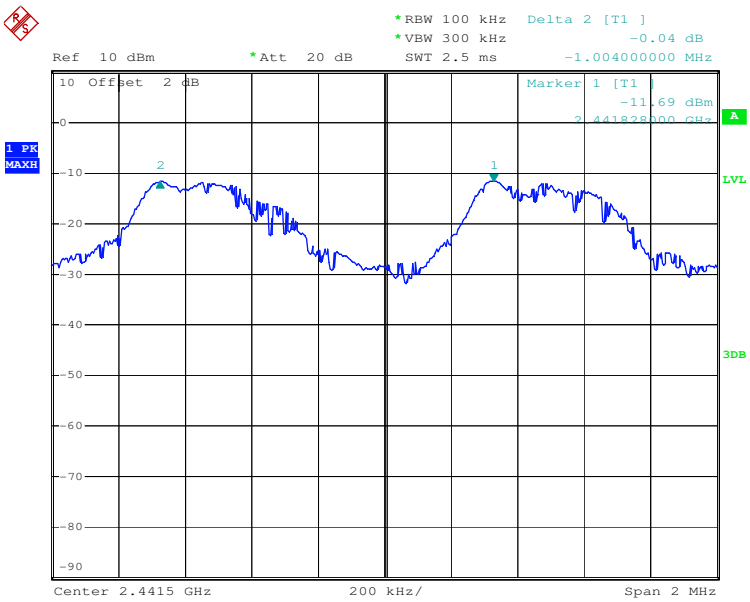
Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest



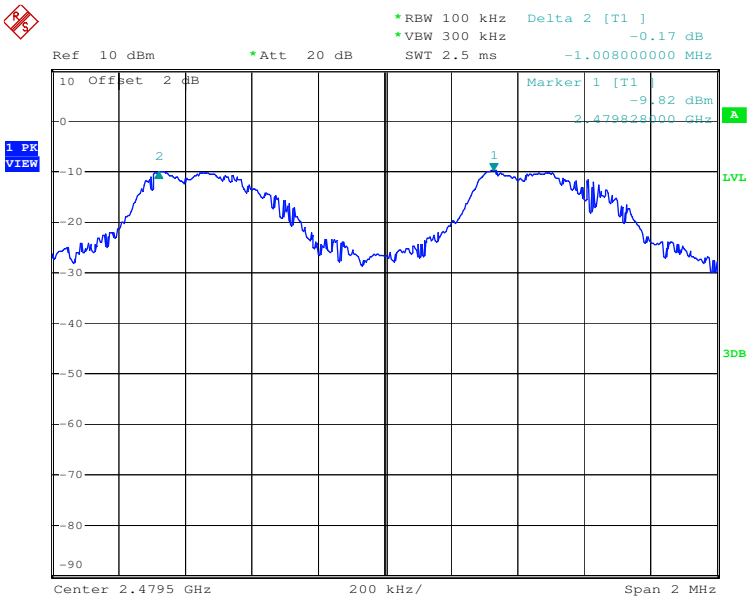
Date: 21.OCT.2009 15:47:41

Test mode:	GFSK	Test channel:	Middle



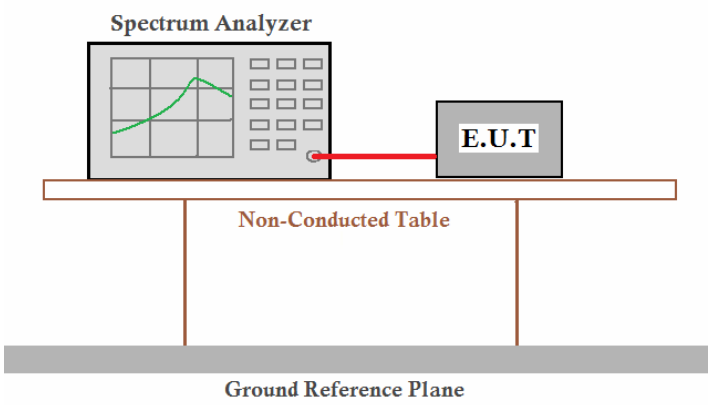
Date: 21.OCT.2009 15:51:39

Test mode:	GFSK	Test channel:	Highest



Date: 21.OCT.2009 15:54:53

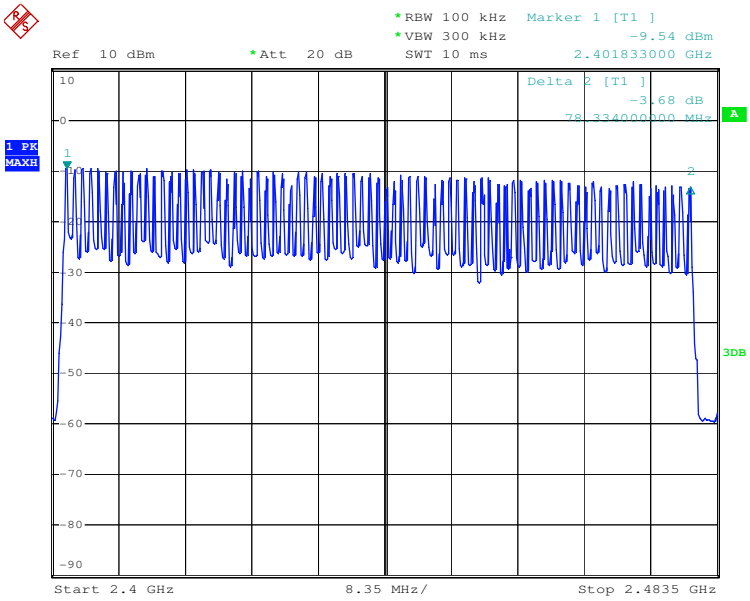
5.6 Hopping Channel Number

Test Requirement:	FCC Part15 C Section 15.247 (b)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Limit:	75channels
Test setup:	
Test Instruments:	Refer to section 4.7 for details
Test state:	Hopping transmitting with modulation.
Test results:	Passed

Measurement Data

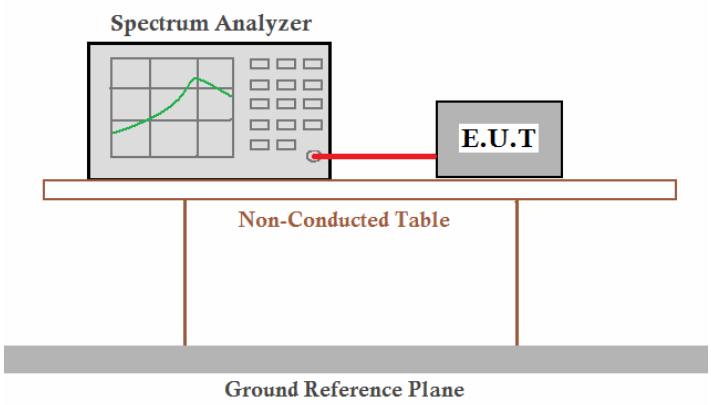
Mode	Hopping channel numbers	Limit
GFSK	79	75

Test plot as follows



Date: 21.OCT.2009 15:20:47

5.7 Dwell Time

Test Requirement:	FCC Part15 C Section 15.247 (a)(1)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Limit:	0.4 Second
Test setup:	
Test Instruments:	Refer to section 4.7 for details
Test state:	Hopping transmitting with modulation.
Test results:	Passed

Measurement Data

Mode	Packet	Dwell time (second)	Limit (second)
GFSK	DH1	0.1254	0.4
	DH3	0.2675	0.4
	DH5	0.3234	0.4

Test Result:

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

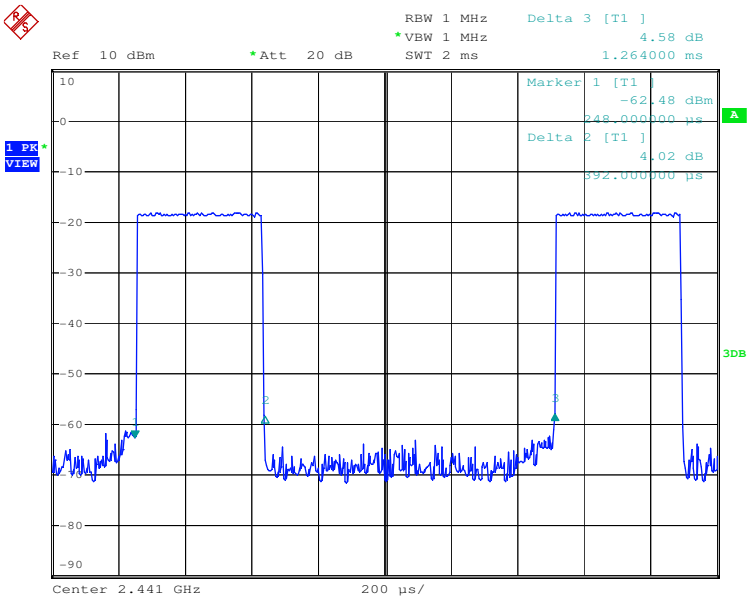
DH1 time slot=0.392(ms)*(1600/ (2*79))*31.6=125.44ms

DH3 time slot=1.672(ms)*(1600/ (4*79))*31.6=267.52ms

DH5 time slot=3.032(ms)*(1600/ (6*79))*31.6=323.41ms

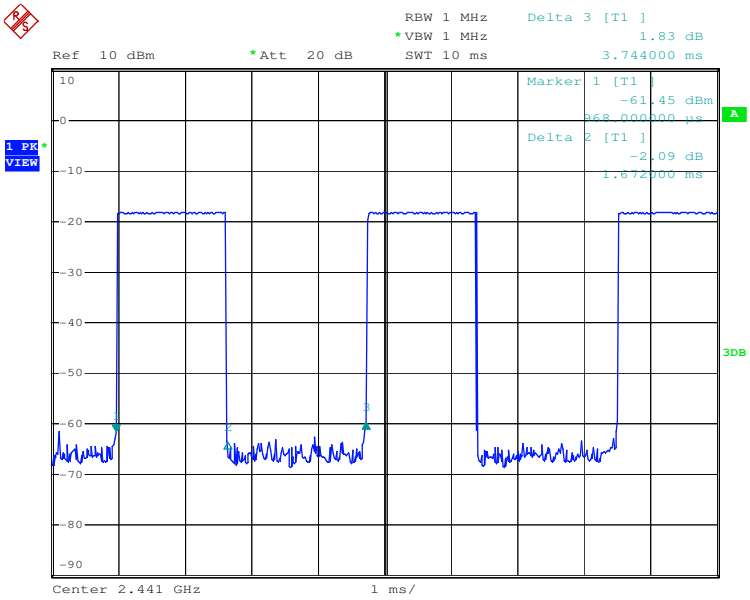
Test plot as follows

Test mode:	GFSK	Test Packet:	DH1



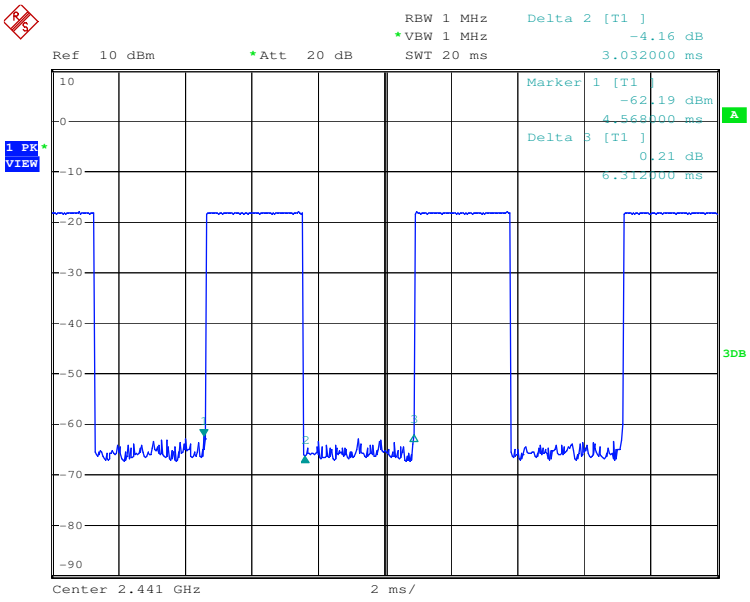
Date: 28.OCT.2009 17:05:08

Test mode:	GFSK	Test Packet:	DH3



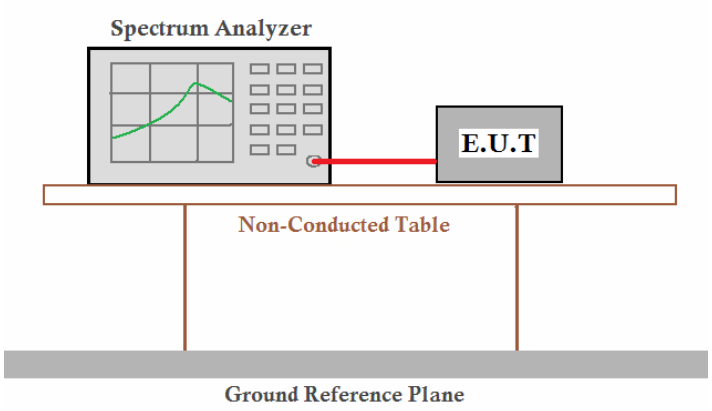
Date: 28.OCT.2009 17:05:50

Test mode:	GFSK	Test Packet:	DH5



Date: 28.OCT.2009 17:07:29

5.8 Band Edge (conducted measurement)

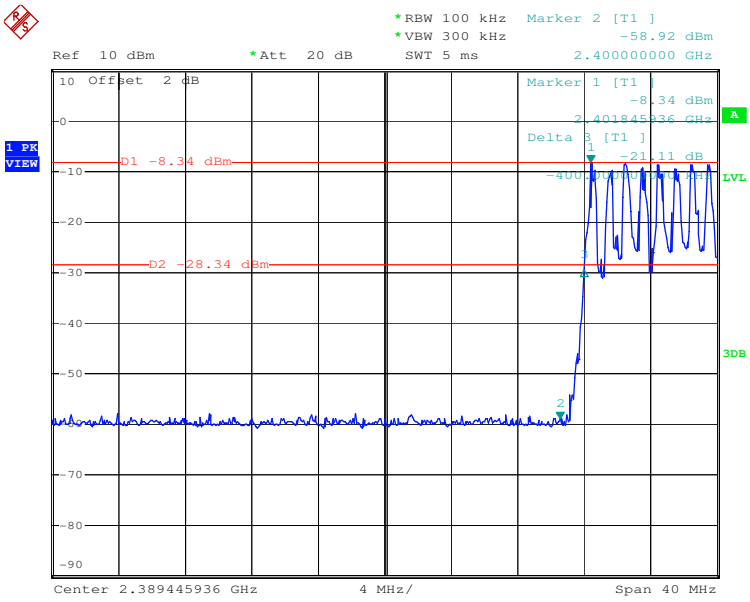
Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
Limit:	In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at 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:	 *Remark:* *Offset the High-Frequency cable loss 2.0dB in the spectrum analyzer.*
Test Instruments:	Refer to section 4.7 for details
Test state:	Hopping transmitting with modulation.
Test results:	Passed

Remark:

Band Edge (radiated measurement) is tested and described in 5.10.3 chapter.

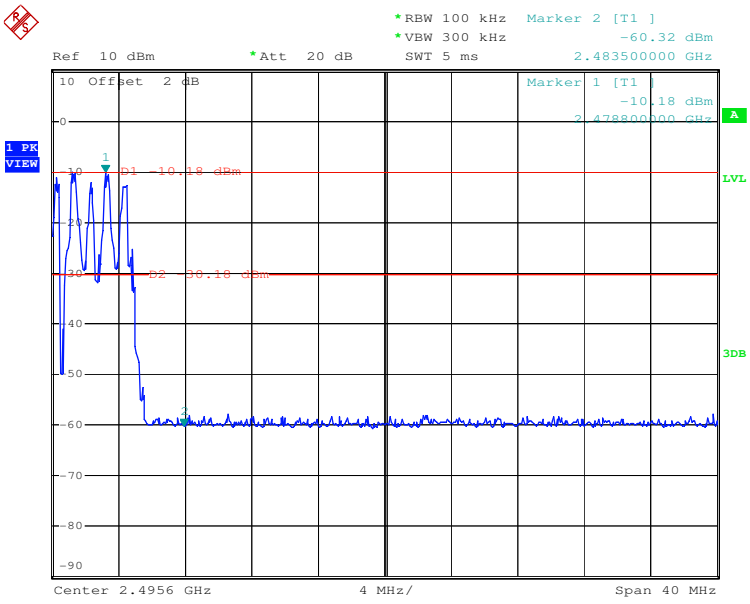
Test plot as follows:

Test mode:	GFSK	Test channel:	Lowest



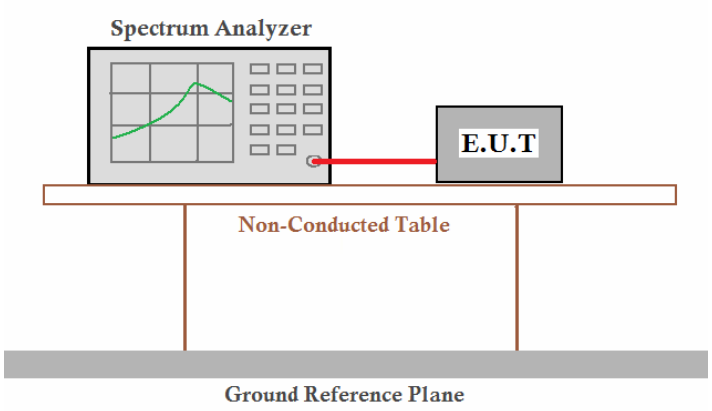
Date: 21.OCT.2009 16:03:01

Test mode:	GFSK	Test channel:	Highest

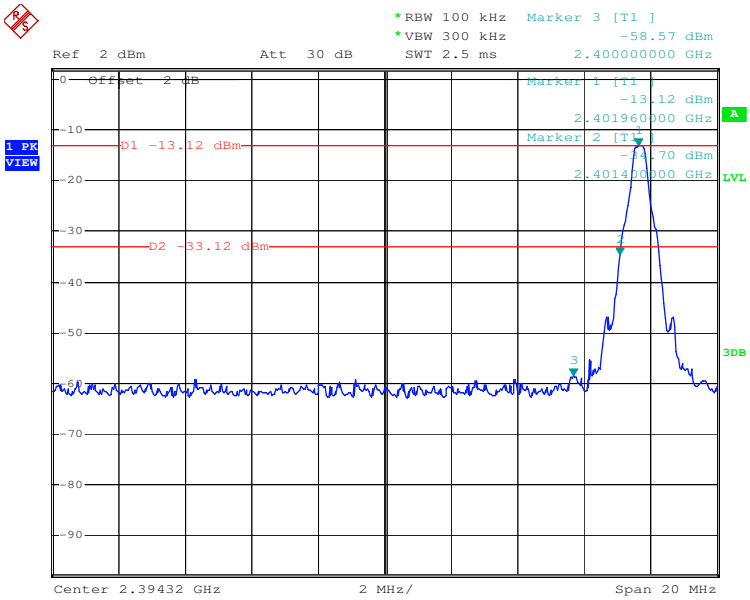


Date: 21.OCT.2009 16:07:55

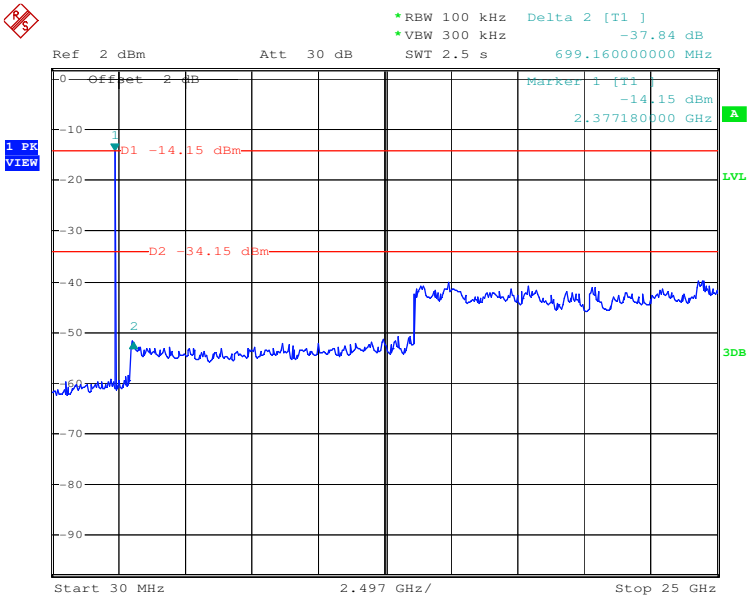
5.9 RF Antenna Conducted spurious emissions

Test Requirement:	FCC Part15 C Section 15.247 (d)
Test Method:	ANSI C63.4:2003 and KDB DA00-705
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:	 *Remark:* *Offset the High-Frequency cable loss 2.0dB in the spectrum analyzer.*
Test Instruments:	Refer to section 4.7 for details
Test results:	Passed

Test mode:	GFSK	Test channel:	Lowest

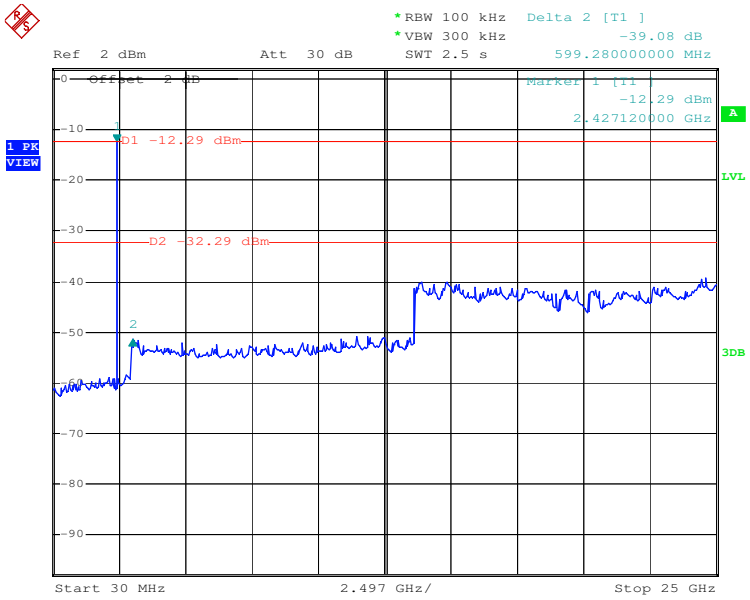


Date: 14.OCT.2009 22:44:13



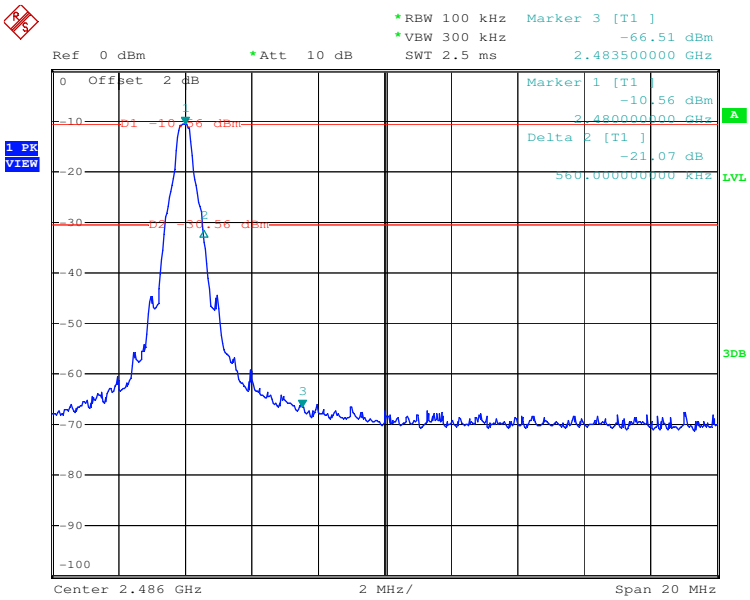
Date: 14.OCT.2009 22:48:07

Test mode:	GFSK	Test channel:	Middle

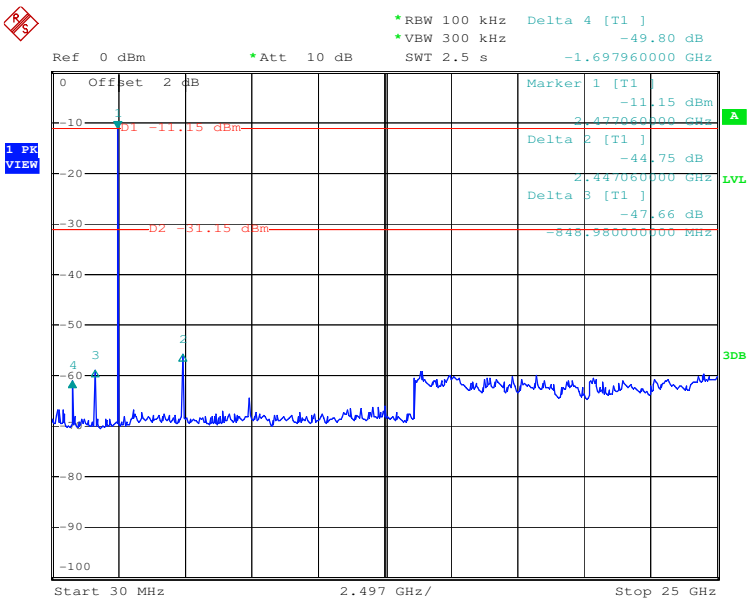


Date: 14.OCT.2009 22:54:38

Test mode:	GFSK	Test channel:	Highest



Date: 15.OCT.2009 04:24:21



Date: 15.OCT.2009 04:33:35

5.10 Pseudorandom Frequency Hopping Sequence

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

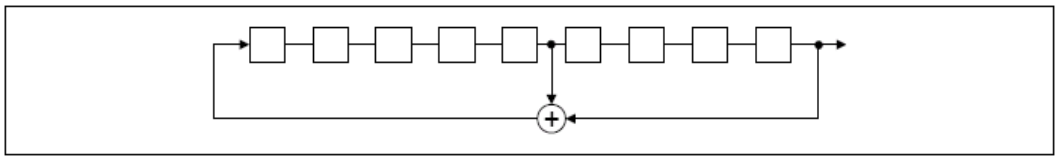
Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

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

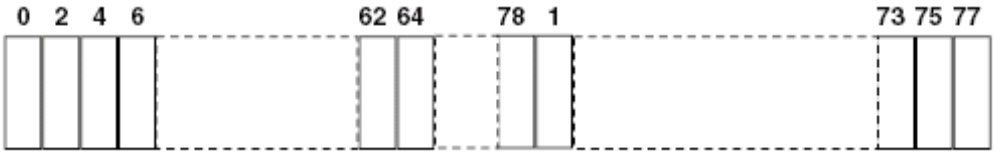
The pseudorandom sequence may be generated in a nine-stage shift register whose 5th and 9th stage outputs are added in a modulo-two addition stage. And the result is fed back to the input of the first stage. The sequence begins with the first ONE of 9 consecutive ONEs; i.e. the shift register is initialized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

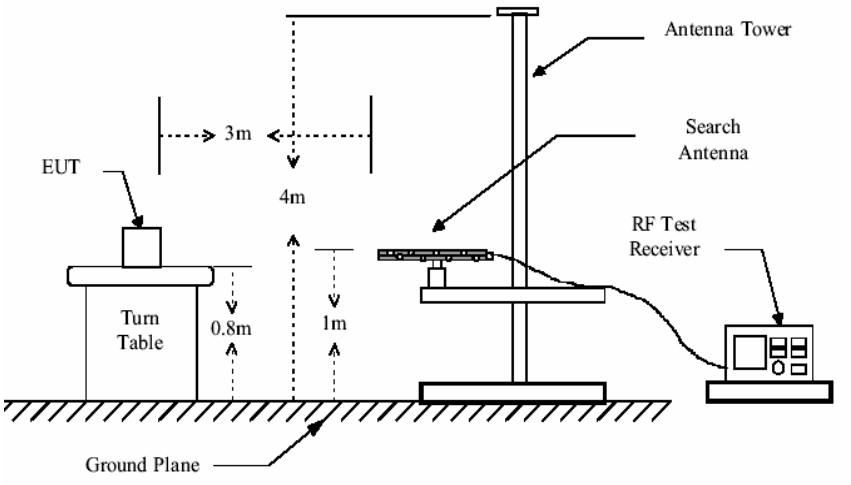


Each frequency used equally on the average by each transmitter.
The system receivers have input bandwidths that match the hopping channel bandwidths of their corresponding transmitters and shift frequencies in synchronization with the transmitted signals.

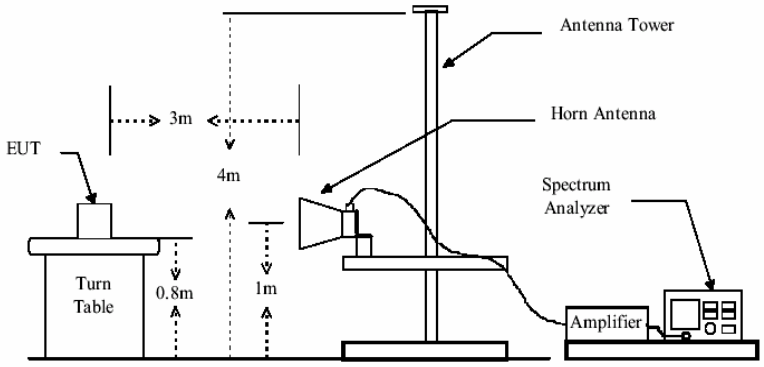
5.11 Radiated Emission

<table>
<tr><td>Test Requirement:</td><td>FCC Part15 C Section 15.209, 15.205 and 15.247(d)</td></tr>
<tr><td>Test Method:</td><td>ANSI C63.4: 2003</td></tr>
<tr><td>Test Frequency Range:</td><td>30MHz to 25GHz</td></tr>
<tr><td>Test site:</td><td>Measurement Distance: 3m (Semi-Anechoic Chamber)</td></tr>
<tr><td>Receiver setup:</td><td>
<table>
<tr><td>Frequency</td><td>Detector</td><td>RBW</td><td>VBW</td><td>Remark</td></tr>
<tr><td>30MHz-1GHz</td><td>Quasi-peak</td><td>100KHz</td><td>300KHz</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>Peak</td><td>1MHz</td><td>3MHz</td><td>Peak Value</td></tr>
<tr><td>Peak</td><td>1MHz</td><td>10Hz</td><td>Average Value</td></tr>
</table>
</td></tr>
<tr><td>Limit:</td><td>
<table>
<tr><td>Frequency</td><td>Limit (dBuV/m @3m)</td><td>Remark</td></tr>
<tr><td>30MHz-88MHz</td><td>40.0</td><td>Quasi-peak Value</td></tr>
<tr><td>88MHz-216MHz</td><td>43.5</td><td>Quasi-peak Value</td></tr>
<tr><td>216MHz-960MHz</td><td>46.0</td><td>Quasi-peak Value</td></tr>
<tr><td>960MHz-1GHz</td><td>54.0</td><td>Quasi-peak Value</td></tr>
<tr><td rowspan="2">Above 1GHz</td><td>54.0</td><td>Average Value</td></tr>
<tr><td>74.0</td><td>Peak Value</td></tr>
</table>
</td></tr>
<tr><td>Test Procedure:</td><td>a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 3 meter semi-anechoic camber. The table was rotated 360 degrees to determine the position of the highest radiation.
b. The EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower.
c. 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.
d. 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 rotatable table was turned from 0 degrees to 360 degrees to find the maximum reading.
e. The test-receiver system was set to Peak Detect Function and Specified Bandwidth with Maximum Hold Mode.
f. 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.</td></tr>
<tr><td>Test Instruments:</td><td>Refer to section 4.7 for details</td></tr>
<tr><td>Test mode:</td><td>Bluetooth mode and charge mode</td></tr>
<tr><td>Test results:</td><td>Passed</td></tr>
</table>

Test setup:	Below 1GHz



Above 1GHz



Note:
The field strength is calculated by adding the Antenna Factor, Cable Factor & Preamplifier. The basic equation with a sample calculation is as follows:

Final Test Level =Receiver Reading + Antenna Factor + Cable Factor – Preamplifier Factor

5.11.1 Radiated emission below 1GHz

Test mode:	Bluetooth mode	Remark:	QP

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
36.790	0.60	12.30	28.12	30.39	15.17	40.00	-24.83	Vertical
71.710	0.85	7.06	28.00	34.18	14.09	40.00	-25.91	Vertical
122.150	1.26	7.85	27.67	37.57	19.01	43.50	-24.49	Vertical
710.940	2.94	21.60	27.24	32.37	29.67	46.00	-16.33	Vertical
797.270	3.20	22.09	26.95	38.04	36.38	46.00	-9.62	Vertical
935.980	3.64	23.30	26.43	36.77	37.28	46.00	-8.72	Vertical
167.740	1.35	9.52	27.33	44.38	27.92	43.50	-15.58	Horizontal
191.020	1.39	10.11	27.20	40.74	25.04	43.50	-18.46	Horizontal
238.550	1.62	11.93	26.96	39.98	26.57	46.00	-19.43	Horizontal
419.940	2.29	16.38	27.47	36.17	27.37	46.00	-18.63	Horizontal
749.740	3.06	21.70	27.11	45.10	42.75	46.00	-3.25	Horizontal
797.270	3.20	22.09	26.95	38.63	36.97	46.00	-9.03	Horizontal

Test mode:	Charge mode	Remark:	QP

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
52.310	0.80	7.80	28.09	37.96	18.47	40.00	-21.53	Vertical
125.060	1.27	7.80	27.64	36.19	17.62	43.50	-25.88	Vertical
230.790	1.58	11.70	27.00	35.78	22.06	46.00	-23.94	Vertical
563.500	2.67	19.02	27.65	34.75	28.79	46.00	-17.21	Vertical
797.270	3.20	22.09	26.95	38.94	37.28	46.00	-8.72	Vertical
935.980	3.64	23.30	26.43	36.22	36.73	46.00	-9.27	Vertical
230.790	1.58	11.70	27.00	36.73	23.01	46.00	-22.99	Horizontal
564.470	2.67	19.02	27.65	33.06	27.10	46.00	-18.90	Horizontal
673.110	2.85	21.40	27.37	33.64	30.52	46.00	-15.48	Horizontal
710.940	2.94	21.60	27.24	40.76	38.06	46.00	-7.94	Horizontal
749.740	3.06	21.70	27.11	43.98	41.63	46.00	-4.37	Horizontal
964.110	3.67	23.70	26.44	32.43	33.36	54.00	-20.64	Horizontal

5.11.2 Transmitter emission above 1GHz

Test mode:	GFSK	Test channel:	Lowest	Remark:	Peak

Frequency (MHz)	Cable Loss (dB)	Antenna Factor (dB/m)	Preamp Factor (dB)	Read Level (dBuV)	Level (dBuV/m)	Limit Line (dBuV/m)	Over Limit (dB)	Polarization
2343	6.11	29.84	39.51	54.45	50.89	74.00	-23.11	Vertical
2394	6.31	30.01	38.95	55.17	52.54	74.00	-21.46	Vertical
2400	6.34	30.03	38.87	53.93	51.43	74.00	-22.57	Vertical
6355	14.42	36.29	41.52	52.40	61.59	74.00	-12.41	Vertical
12611	17.30	39.48	39.39	44.23	61.62	74.00	-12.38	Vertical
16334	18.42	41.23	40.12	43.74	63.27	74.00	-10.73	Vertical
2343	6.11	29.84	39.51	55.10	51.54	74.00	-22.46	Horizontal
2394	6.31	30.01	38.95	58.54	55.91	74.00	-18.09	Horizontal
2400	6.34	30.03	38.87	54.13	51.63	74.00	-22.37	Horizontal
5607	12.72	35.30	42.02	54.46	60.46	74.00	-13.54	Horizontal
6712	13.35	36.76	40.49	51.38	61.00	74.00	-13.00	Horizontal
12271	17.87	39.26	39.34	44.08	61.87	74.00	-12.13	Horizontal

Test mode:	GFSK	Test channel:	Lowest	Remark:	Average

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBµV)	Emission Level (dBµV/m)	Limit (dBµV/m)	Over limit (dB)	Polarization
2343	6.11	29.84	39.51	34.50	30.94	54.00	-23.06	Vertical
2394	6.31	30.01	38.95	35.60	32.97	54.00	-21.03	Vertical
2400	6.34	30.03	38.87	36.50	34.00	54.00	-20.00	Vertical
6338	14.43	36.27	41.55	32.50	41.65	54.00	-12.35	Vertical
7800	14.34	37.60	39.65	26.50	38.79	54.00	-15.21	Vertical
12169	18.03	39.21	39.27	22.40	40.37	54.00	-13.63	Vertical
2360	6.17	29.88	39.35	34.50	31.20	54.00	-22.80	Horizontal
2394	6.31	30.01	38.95	35.20	32.57	54.00	-21.43	Horizontal
2400	6.34	30.03	38.87	36.50	34.00	54.00	-20.00	Horizontal
5641	12.78	35.37	42.01	32.50	38.64	54.00	-15.36	Horizontal
6865	13.58	36.95	40.52	28.50	38.51	54.00	-15.49	Horizontal
15467	17.44	40.85	42.28	25.41	41.42	54.00	-12.58	Horizontal

Test mode:	GFSK	Test channel:	Middle	Remark:	Peak

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
2326	6.02	29.76	39.75	55.00	51.03	74.00	-22.97	Vertical
4043	8.10	33.15	40.66	54.15	54.74	74.00	-19.26	Vertical
5250	11.78	34.85	41.18	53.07	58.52	74.00	-15.48	Vertical
6338	14.43	36.27	41.55	52.77	61.92	74.00	-12.08	Vertical
7851	13.97	37.62	39.74	47.98	59.83	74.00	-14.17	Vertical
12271	17.87	39.26	39.34	43.66	61.45	74.00	-12.55	Vertical
2343	6.11	29.84	39.51	55.41	51.85	74.00	-22.15	Horizontal
3771	7.47	32.85	39.97	53.18	53.53	74.00	-20.47	Horizontal
5199	11.71	34.77	41.19	54.36	59.65	74.00	-14.35	Horizontal
7749	13.85	37.56	39.52	47.90	59.79	74.00	-14.21	Horizontal
12186	18.03	39.21	39.27	43.66	61.63	74.00	-12.37	Horizontal
16079	18.20	40.78	40.43	44.91	63.46	74.00	-10.54	Horizontal

Test mode:	GFSK	Test channel:	Middle	Remark:	Average

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
2343	6.11	29.84	39.51	34.20	30.64	54.00	-23.36	Vertical
3601	8.44	32.66	41.01	32.50	32.59	54.00	-21.41	Vertical
4978	11.54	34.46	41.09	32.51	37.42	54.00	-16.58	Vertical
6355	14.42	36.29	41.52	32.40	41.59	54.00	-12.41	Vertical
9398	13.92	37.92	37.66	24.51	38.69	54.00	-15.31	Vertical
15450	17.30	40.87	42.71	23.50	38.96	54.00	-15.04	Vertical
2377	6.25	29.96	39.11	34.80	31.90	54.00	-22.10	Horizontal
5879	13.05	35.66	41.98	32.49	39.22	54.00	-14.78	Horizontal
8378	12.97	37.74	38.49	25.60	37.82	54.00	-16.18	Horizontal
10962	15.08	38.29	37.49	23.50	39.38	54.00	-14.62	Horizontal
12764	17.08	39.57	39.13	22.40	39.92	54.00	-14.08	Horizontal
17371	19.80	42.98	39.66	20.50	43.62	54.00	-10.38	Horizontal

Test mode:	GFSK	Test channel:	Highest	Remark:	Peak

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
2343	6.11	29.84	39.51	54.38	50.82	74.00	-23.18	Vertical
2483.5	6.22	30.32	39.53	53.60	50.61	74.00	-23.39	Vertical
2496	5.99	30.35	39.34	53.28	50.28	74.00	-23.72	Vertical
5607	12.72	35.30	42.02	53.77	59.77	74.00	-14.23	Vertical
7766	14.01	37.57	39.56	46.64	58.66	74.00	-15.34	Vertical
11506	15.53	38.70	38.43	41.98	57.78	74.00	-16.22	Vertical
2326	6.02	29.76	39.75	53.51	49.54	74.00	-24.46	Horizontal
2483.5	6.22	30.32	39.53	53.01	50.02	74.00	-23.98	Horizontal
2496	5.99	30.35	39.34	53.07	50.07	74.00	-23.93	Horizontal
6695	13.32	36.73	40.57	51.05	60.53	74.00	-13.47	Horizontal
10775	14.89	38.25	36.99	42.10	58.25	74.00	-15.75	Horizontal
14583	17.39	41.31	45.71	47.63	60.62	74.00	-13.38	Horizontal

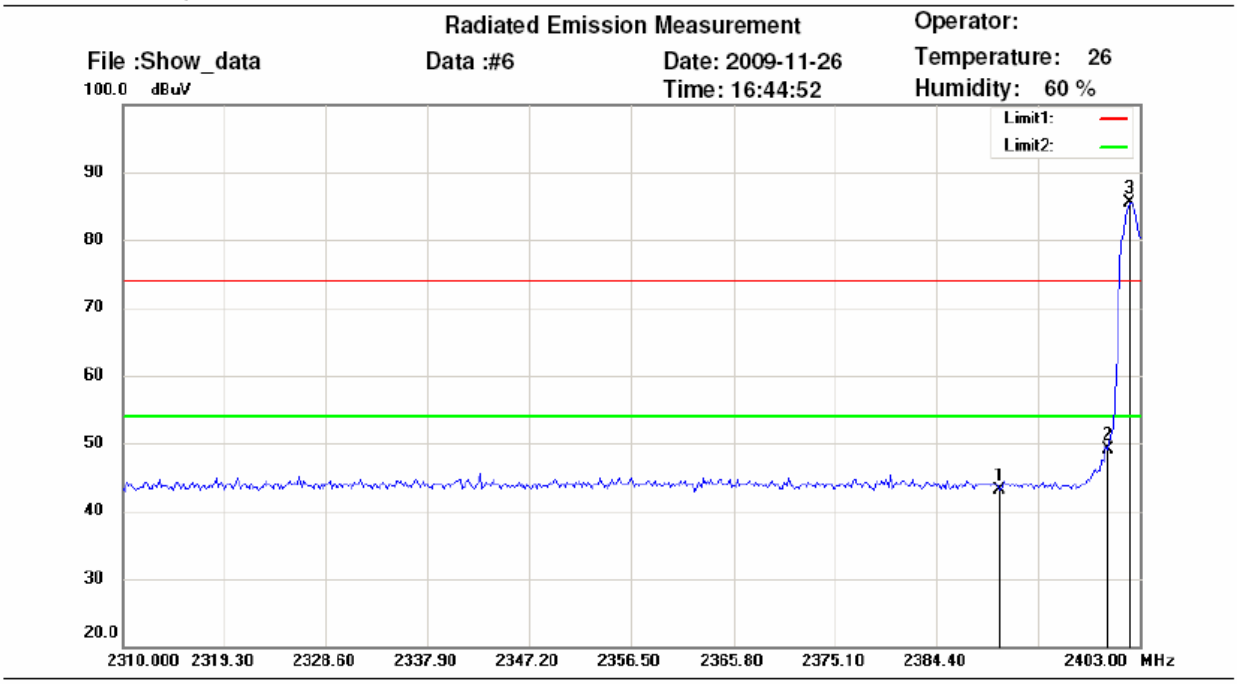
Test mode:	GFSK	Test channel:	Highest	Remark:	Average

Frequency (MHz)	Cable loss (dB)	Antenna factors (dB/m)	Preamp factor (dB)	Reading Level (dBμV)	Emission Level (dBμV/m)	Limit (dBμV/m)	Over limit (dB)	Polarization
2326	6.02	29.76	39.75	35.61	31.64	54.00	-22.36	Vertical
2483.5	6.22	30.32	39.53	35.60	32.61	54.00	-21.39	Vertical
2496	5.99	30.35	39.34	34.30	31.30	54.00	-22.70	Vertical
5369	11.90	35.00	41.36	32.79	38.33	54.00	-15.67	Vertical
8429	13.07	37.75	38.31	26.80	39.31	54.00	-14.69	Vertical
15229	17.22	40.99	44.85	29.60	42.96	54.00	-11.04	Vertical
2326	6.02	29.76	39.75	36.21	32.24	54.00	-21.76	Horizontal
2483.5	6.22	30.32	39.53	35.60	32.61	54.00	-21.39	Horizontal
2496	5.99	30.35	39.34	35.70	32.70	54.00	-21.30	Horizontal
7052	13.63	37.14	41.29	31.60	41.08	54.00	-12.92	Horizontal
12169	18.03	39.21	39.27	23.80	41.77	54.00	-12.23	Horizontal
15484	17.44	40.85	42.28	25.91	41.92	54.00	-12.08	Horizontal

Remark: The disturbance above 16GHz was very low, and the above harmonics were the highest point could be found when testing, so only the above harmonics had been displayed.

5.11.3 Band Edge (Radiated measurement)

Test mode:	GFSK	Test channel:	Lowest	Polarization:	Vertical



Site : Shenzhen EMC_Lab
Condition : FCC Part15 RE-Class B_Above 1GHz_PK
EUT :
M/N:
Test Mode :
Note :

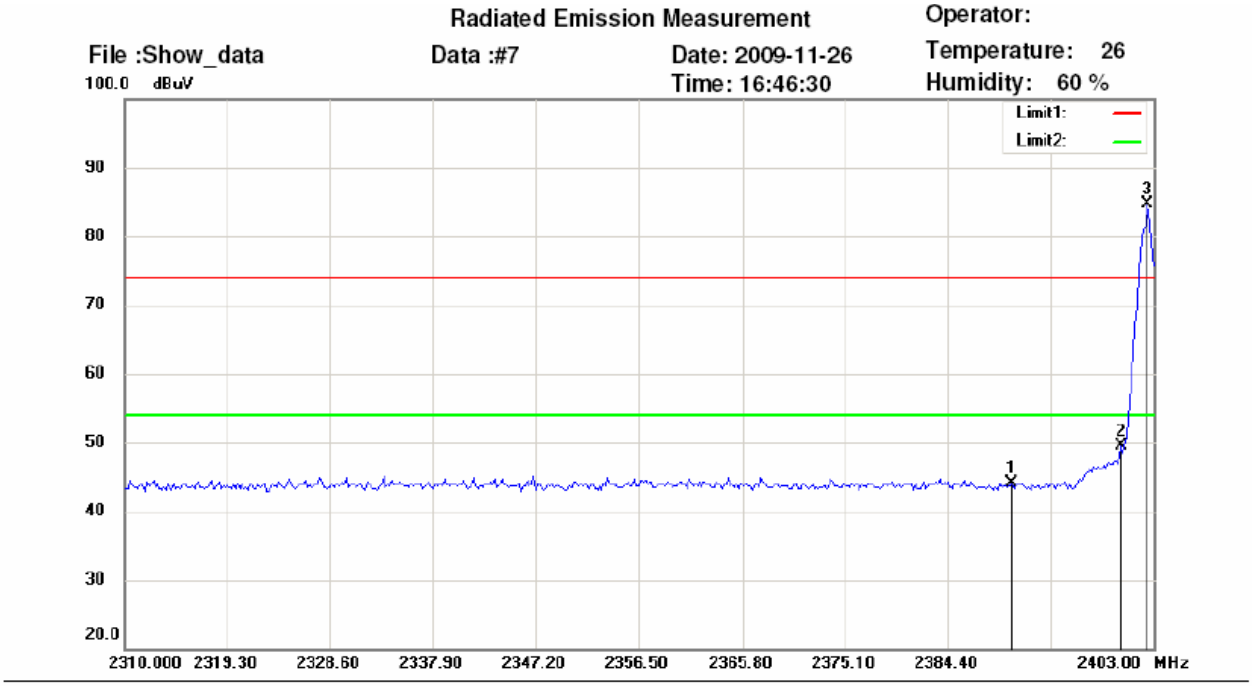
Polarization: *Vertical*
Power : 0
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	2390.000	48.23	peak	-5.11	43.12	74.00			-30.88	
	2400.000	54.29	peak	-5.10	49.19	74.00			-24.81	
*	2402.070	90.64	peak	-5.09	85.55	74.00			11.55	

Remark:

From above plot, we can calculate that the radio frequency power that is produced by the intentional radiator is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, so it is compliance to the limit requirement of band edge.

Test mode:	GFSK	Test channel:	Lowest	Polarization:	Horizontal



Site : Shenzhen EMC_Lab
Condition : FCC Part15 RE-Class B_Above 1GHz_PK
EUT :
M/N:
Test Mode :
Note :

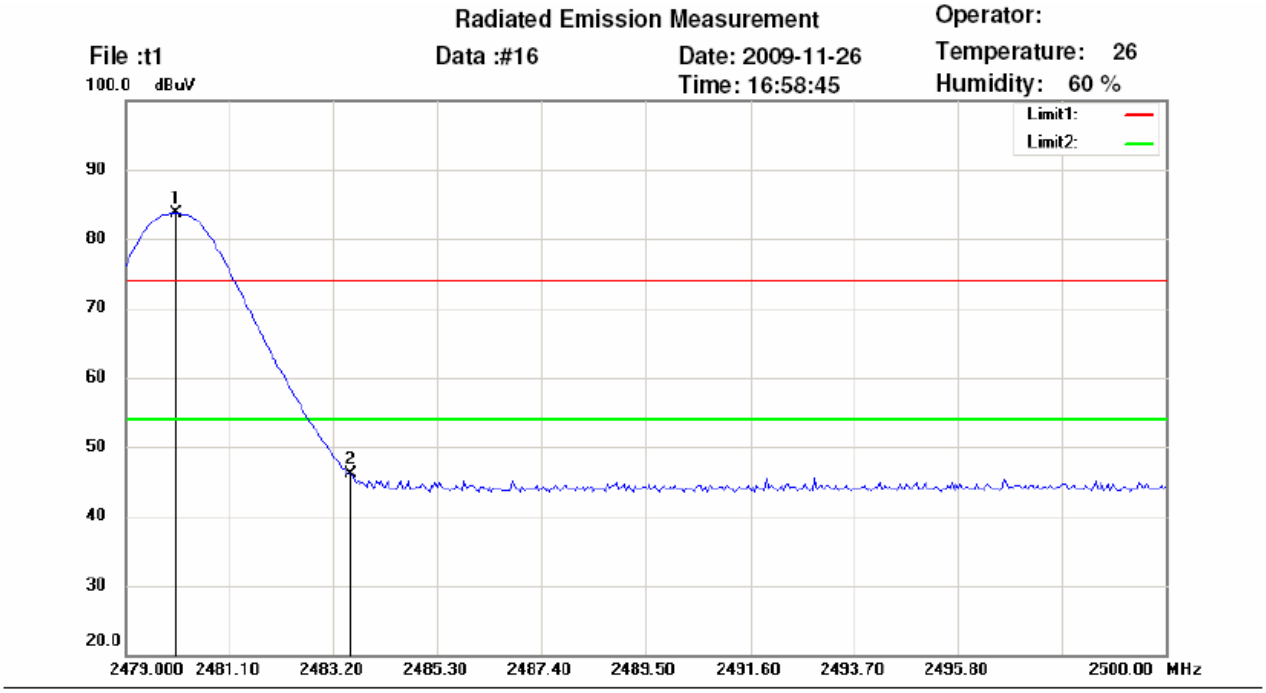
Polarization: *Horizontal*
Power : 0
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
	2390.000	49.20	peak	-5.11	44.09	74.00			-29.91	
	2400.000	54.68	peak	-5.10	49.58	74.00			-24.42	
*	2402.442	89.84	peak	-5.09	84.75	74.00			10.75	

Remark:

From above plot, we can calculate that the radio frequency power that is produced by the intentional radiator is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, so it is compliance to the limit requirement of band edge.

Test mode:	GFSK	Test channel:	Highest	Polarization:	Vertical



Site : Shenzhen EMC_Lab
Condition : FCC Part15 RE-Class B_Above 1GHz_PK
EUT :
M/N:
Test Mode :
Note :

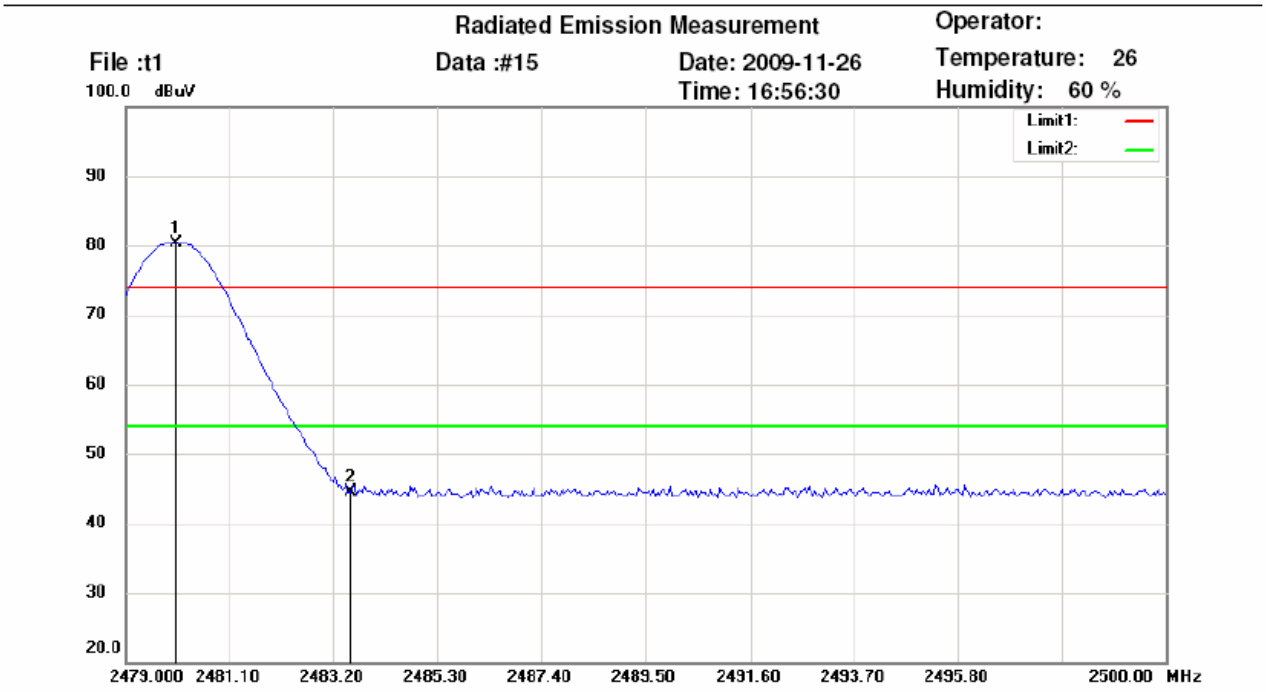
Polarization: *Vertical*
Power : 0
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	2480.000	88.65	peak	-4.99	83.66	74.00			9.66	
	2483.500	51.05	peak	-4.99	46.06	74.00			-27.94	

Remark:

From above plot, we can calculate that the radio frequency power that is produced by the intentional radiator is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, so it is compliance to the limit requirement of band edge.

Test mode:	GFSK	Test channel:	Highest	Polarization:	Horizontal



Site : Shenzhen EMC_Lab
Condition : FCC Part15 RE-Class B_Above 1GHz_PK
EUT :
M/N:
Test Mode :
Note :

Polarization: *Horizontal*
Power : 0
Distance: 3m

Mk.	Frequency (MHz)	Reading (dBuV)	Detector	Corrected factor(dB)	Result (dBuV)	Limit (dBuV)	Ant.Pos (cm)	Tab.Pos (deg.)	Margin (dB)	Comment
*	2480.000	85.33	peak	-4.99	80.34	74.00			6.34	
	2483.500	49.55	peak	-4.99	44.56	74.00			-29.44	

Remark:

From above plot, we can calculate that the radio frequency power that is produced by the intentional radiator is at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, so it is compliance to the limit requirement of band edge.