Application for FCC Certification
On behalf of
Holley Group Co., Ltd.

Product Name: 20mW Short-range ZigBee Module

Model No.: HT-MDL-Z-EM-2400-021-X
Serial No.: E08061901
Trademark 1#: Holley
Trademark 2#: Hornetone

FCC ID: VQMHZME1A

Prepared For : Holley Group Co., Ltd.
No.8 Liansheng Road, Xianlin, Hangzhou,
310023 .P.R. China

Prepared By :Audix Technology (Shanghai) Co., Ltd.
3F 34Bldg 680 Guiping Rd.,
Caohejing Hi-Tech Park,
Shanghai 200233, China

Tel: +86-21-64955500
Fax: +86-21-64955491

Report No. : ACI-F08039
Date of Test : June 19 –June 21, 2008
Date of Report : June 23, 2008

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TEST REPORT FOR FCC CERTIFICATION

Applicant	:	Holley Group Co., Ltd.
Manufacturer 1#	:	Holley Group Co., Ltd.
Trademark 1#	:	Holley
Manufacturer 2#	:	Zhejiang Hornetone Information Technology Co., Ltd.
Trademark 2#	:	Hornetone
EUT Description	:	20mW Short-range ZigBee Module
	(A) Model No.	: HT-MDL-Z-EM-2400-021-X
	(B) Serial No.	: E08061901
	(C) Power Supply	: DC 3.3V

Test Procedure Used:

FCC RULES AND REGULATIONS PART 15 SUBPART C OCTOBER 2007 AND ANSI C63.4-2003

The device described above is tested by Audix Technology (Shanghai) Co., Ltd. to determine the maximum emission levels emanating from the device. The maximum emission levels are compared to the FCC Part 15 Subpart C limits.

The test results are contained in this test report and Audix Technology (Shanghai) Co., Ltd. is assumed full responsibility for the accuracy and completeness of these measurements. This report also shows that the EUT (M/N: HT-MDL-Z-EM-2400-021-X, S/N: E08061901), which was tested on Jun 19-21, 2008 is technically compliance with the FCC official limits.

This report applies to above tested sample only. This report shall not be reproduced in part without written approval of Audix Technology (Shanghai) Co., Ltd.

This 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.

Date of Test : Jun 19-21, 2008

Prepared By: Alan He 2008.06.26
ALAN HE / Assistant

Reviewer: 2008.06.26
Byron Wu / Supervisor

AUDIX® For and on behalf of
Audix Technology (Shanghai) Co., Ltd.

Approved Signatory: 2008.06.26
Authorized Signature EMC SAMMY CHEN / Assistant Manager

1 SUMMARY OF STANDARDS AND RESULTS

1.1 Description of Standards and Results

The EUT have been tested according to the applicable standards as referenced below:

Description / Test Item	Test Standard	Results	Meets Limit
EMISSION			
Radiated Disturbance	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.209
6 dB Bandwidth Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.247(a)(2)
Maximum Peak Output Power Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.247(b)(3)
RF Exposure Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.247(i)
Emission Limitations Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.247(d)
Band Edge Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.247(d)
Power Spectral Density Measurement	FCC RULES AND REGULATIONS PART 15 SUBPART C October 2007 AND ANSI C63.4:2003	Pass	15.247(e)

2 GENERAL INFORMATION

2.1 Description of Equipment Under Test

Description	:	20mW Short-range ZigBee Module
Type of EUT		☐ Production ☑ Pre-product ☐ Pro-type
Model Number	:	HT-MDL-Z-EM-2400-021-X
Serial Number	:	E08061901
Note	:	The X in the model number means different connector which connected with antenna. The character A means straight and the character B means curved.
Applicant	:	Holley Group Co., Ltd. Address 1#: No.8 Liansheng Road,Xianlin,Hangzhou, 310023 .P.R. China
Manufacturer 1#	:	Holley Group Co., Ltd. Address 1#: No.8 Liansheng Road,Xianlin,Hangzhou, 310023 .P.R. China
Trademark 1#	:	Holley
Manufacturer 2#	:	Zhejiang Hornetone Information Technology Co., Ltd. No.8 Liansheng Road,Xianlin,Hangzhou, 310023 .P.R. China
Trademark 2#	:	Hornetone
Power Supply	:	DC 3.3V (from batteries on Motherboard)
Radio Tech	:	IEEE 802.15.4 (ZigBee®)
Freq. Band	:	2405 MHz ~ 2475 MHz In 5 MHz Separation
Tested Freq.	:	2405 MHz (Channel 11) 2440 MHz (Channel 18) 2475 MHz (Channel 25)
Freq. Channel	:	15 channels

2.2 Supported Simulators

2.2.1 Motherboard

Manufacturer : Holley
Model Number : 05-X02-27VSL1

2.2.2 Antenna

Manufacturer : Off the sheff
Model Number : ANT-FW-2400-1.3-B
Gain : 2.1 dBi

2.2.3 Battery Box : Batteries (Size AA * 4)

2.3 Description of Test Facility

Site Description (Semi-Anechoic Chamber) : Sept. 17, 1998 file on June 26, 2006 Renewed
Federal Communications Commission
FCC Engineering Laboratory
7435 Oakland Mills Road
Columbia, MD 21046, USA

Name of Firm : Audix Technology (Shanghai) Co., Ltd.

Site Location : 3 F 34 Bldg 680 Guiping Rd.,
Caohejing Hi-Tech Park,
Shanghai, China 200233

FCC registration Number : 91789

Accredited by NVLAP, Lab Code : 200371-0

2.4 Measurement Uncertainty

Radiated Disturbance Expanded Uncertainty : U = 2.96 dB

3 RADIATED EMISSION TEST

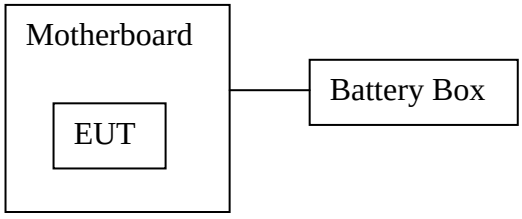
3.1 Test Equipment

The following test equipment are used during the radiated emission test in a semi-anechoic chamber:

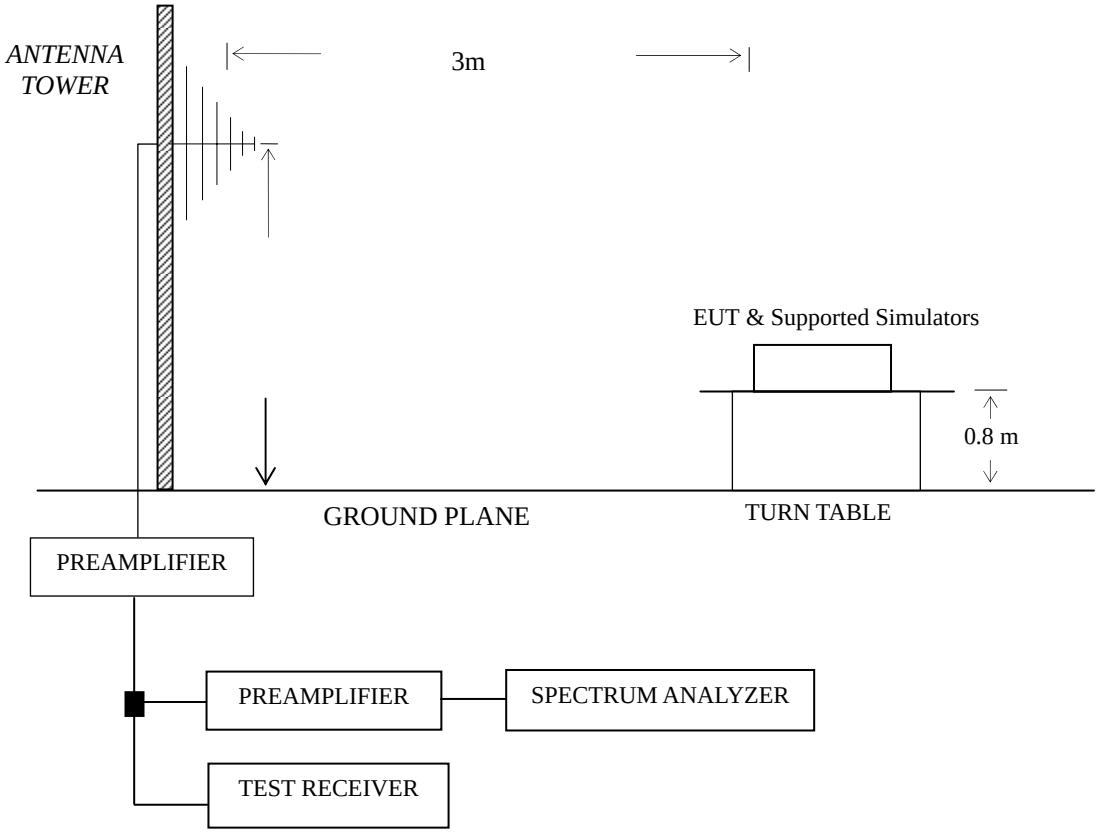
Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Preamplifier	HP	8447D	2944A06849	Mar 19, 2008	Sep 18, 2008
2.	Spectrum Analyzer	Agilent	E7405A	MY45106600	May 06, 2008	May0 6, 2009
3.	Test Receiver	R&S	ESVS10	832699/004	Apr 02, 2008	Apr 01, 2009
4.	Bilog Antenna	Chase	CBL6111	1145	Mar 18, 2008	Sep 18, 2008
5.	Horn Antenna	EMCO	3115	9607-4878	Oct 26, 2007	Oct 25, 2009
6.	Horn Antenna	EMCO	3116	00062643	Oct 26, 2007	Oct 25, 2009
7.	50Ω Coaxial Switch	Anritsu	MP59B	6200426390	Mar 19, 2008	Sep 18, 2008
8.	Software	Audix	E3	SET00200 9912M295-2	-	-

3.2 Block Diagram of Test Setup

3.2.1 EUT & Supported Simulators



3.2.2 Test Setup



■ : 50 ohm Coaxial Switch

3.3 Radiated Emission Limit [FCC Part 15 Subpart C 15.209]

Frequency (MHz)	Distance (m)	Field strength limits (μV/m)	
		(μV/m)	dB(μV/m)
30 ~ 88	3	100	40.0
88 ~ 216	3	150	43.5
216 ~ 960	3	200	46.0
Above 960	3	500	54.0

NOTE 1 - Emission Level dB(μV/m) = 20 lg Emission Level (μV/m)
NOTE 2 - The tighter limit applies at the band edges.
NOTE 3 - Distance refers to the distance in meters between the measuring instrument antenna and the closed point of any part of the device or system.
NOTE 4 - On any frequencies above 1000MHz, there is also a limit on the radio frequency emissions, as measured using instrumentation with a peak detector function corresponding to 20 dB above the maximum permitted average limit for the frequency being investigated.

3.4 Test Configuration

The EUT (listed in Sec.2.1) and the simulators (listed in Sec2.2) were installed as shown on Sec.3.2 to meet FCC requirements and operating in a manner that tends to maximize its emission level in a normal application.

3.5 Operating Condition of EUT

3.5.1 Setup the EUT as shown in Sec. 3.2.

3.5.2 Turn on the power of all equipment.

3.5.3 Turn the EUT on the test mode and then test.

3.6 Test Procedures

The EUT and simulators were placed on a turntable that is 0.8 meter above ground. The turntable rotated 360 degrees to determine the position of the maximum emission level. The EUT was set 3 meters away from the receiving antenna, which was mounted on an antenna tower. The antenna moved up and down between 1 meter and 4 meters to find out the maximum emission level. Broadband antenna (Calibrated Bilog Antenna) or Horn antenna was used as receiving antenna. Both horizontal and vertical polarizations of the antenna were set on measurement. In order to find the maximum emission, all of the interference cables were manipulated according to ANSI C63.4:2003 requirements during radiated emission test.

The bandwidth of Test Receiver R&S ESVS10 was set at 120 kHz from 30M to 1000MHz.

The bandwidth of Spectrum Analyzer Agilent E7405A was set at 1MHz above 1 GHz.

The frequency range from 30 MHz to 25 GHz (Up to 10^{th} harmonics from fundamental frequency) was checked.

The EUT was tested under the following test modes:

Mode	Operation	Channel	Frequency
1.	Transmitting	11	2405 MHz
2.		18	2440 MHz
3.		25	2475 MHz
4.	Receiving	18	2440 MHz

Note: when the EUT was in transmitting mode, it sent 40bytes per data frame. The repetition interval is 5ms. The modulation method is DSSS.

All the test results are listed in Sec.3.7.

3.7 Test Results

<PASS>

The frequency and amplitude of the highest radiated emission relative the limit is reported. All the emissions not reported below are too low against the FCC limit.

Mode	Operation	Channel	Frequency	Data Page	
				Low Frequency	High Frequency
1.	Transmitting	11	2405 MHz	P12-P13	P14-P15
2.		18	2440 MHz	P16-P17	P18-P19
3.		25	2475 MHz	P20-P21	P22-P23
4.	Receiving	18	2440 MHz	P24-P25	P26-P27

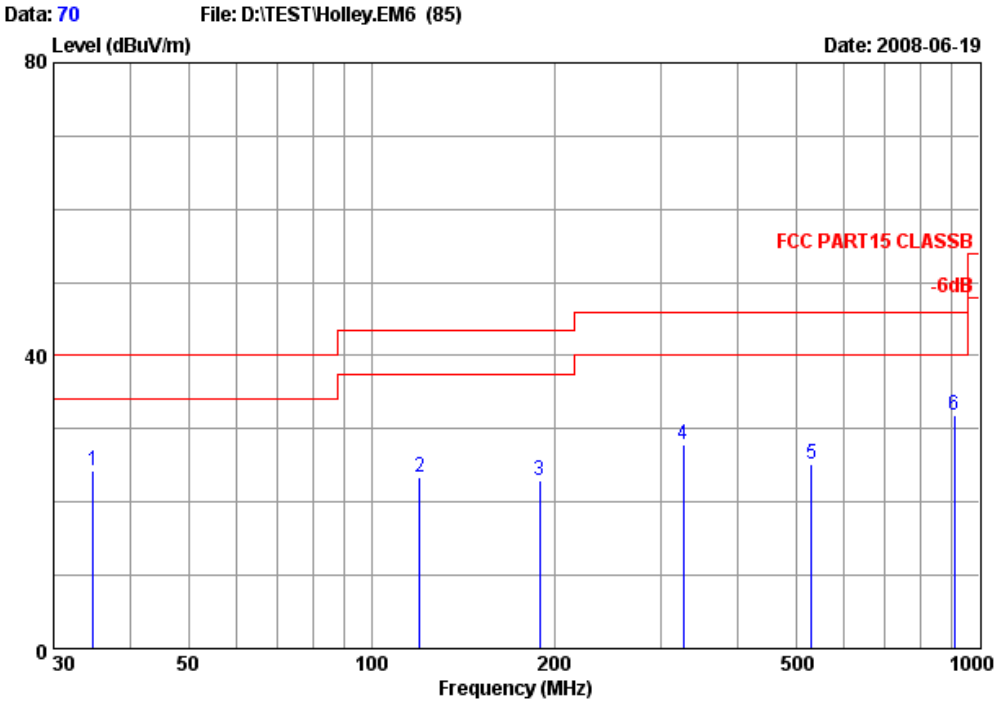
Band –Edges Radiated Spurious emissions 15.205 are on page 28-29.

NOTE 1 - All reading are Quasi-Peak values below or equal to 1GHz and Peak values above 1GHz. For measurements above 1 GHz, the peak measured value complies with the average limit, it is unnecessary to perform an average measurement.

NOTE 2 - 0° was the table front facing the antenna. Degree is calculated from 0° clockwise facing the antenna.

NOTE 3 – The worst case is for Receiving 2440 MHz CH 18. The worst emission at horizontal polarization was detected at 31.940 MHz with corrected signal level of 23.58 dB (μV/m) (limit is 40.00 dB (μV/m)), when the antenna was 1.50 m height and the turntable was at 90°. The worst emission at vertical polarization was detected at 782.720 MHz with corrected signal level of 37.00 dB (μV/m) (limit is 46.00 dB (μV/m)), when the antenna was 1.00 m height and the turntable was at 135°.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB
Env. / Ins. : 23*C 54% / ESVS10
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Meno : CH 11(2405MHz)

Data no. : 70
Ant. pol. : HORIZONTAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	34.85	16.97	0.93	6.47	24.37	40.00	15.63
2	120.21	12.98	1.86	8.64	23.48	43.50	20.02
3	189.08	10.24	2.28	10.52	23.04	43.50	20.46
4	325.85	14.62	3.27	9.88	27.77	46.00	18.23
5	529.55	18.30	4.07	2.73	25.10	46.00	20.90
6	908.82	21.76	5.70	4.46	31.92	46.00	14.08

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
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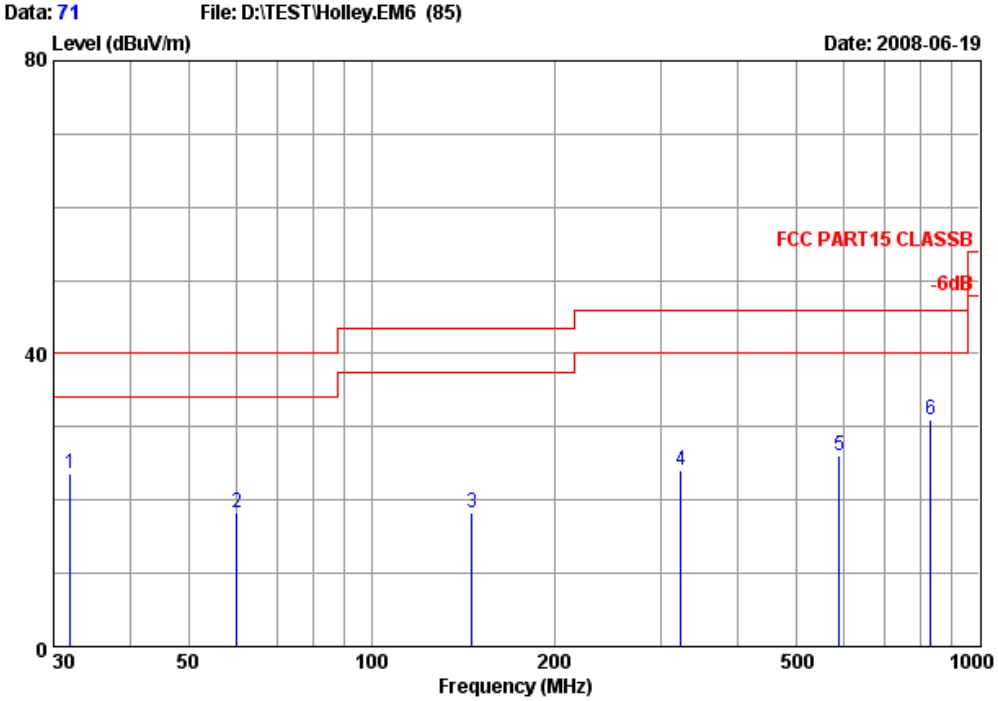
audixaci@audix.com



Site no : Audix ACI (3m Chamber) Data no. : 71
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB Ant. pol. : VERTICAL
Env. / Ins. : 23*C 54% / ESVS10 Engineer : Leo
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Meno : CH 11(2405MHz)

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	31.94	18.49	0.92	4.17	23.58	40.00	16.42
2	60.07	6.60	1.22	10.35	18.17	40.00	21.83
3	146.40	11.61	2.05	4.69	18.35	43.50	25.15
4	322.94	14.54	3.25	6.33	24.12	46.00	21.88
5	587.75	19.06	4.20	2.72	25.98	46.00	20.02
6	833.16	21.01	5.50	4.47	30.98	46.00	15.02

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

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3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
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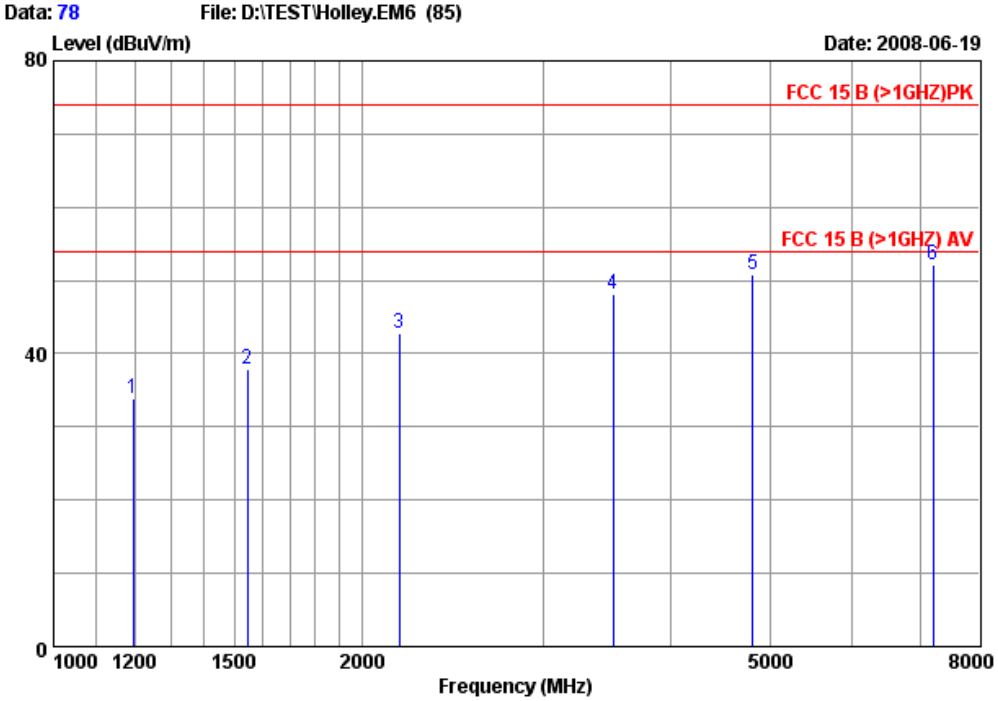

Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Memo : CH 11(2405MHz)

Data no. : 78
Ant. pol. : HORIZONTAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1196.00	25.00	37.18	7.07	39.03	33.92	74.00	40.08	Peak
2	1546.00	26.30	36.44	8.57	39.40	37.83	74.00	36.17	Peak
3	2176.00	28.20	35.51	10.50	39.67	42.86	74.00	31.14	Peak
4	3513.00	31.65	34.15	12.06	38.68	48.24	74.00	25.76	Peak
5	4808.00	33.25	34.59	12.46	39.71	50.83	74.00	23.17	Peak
6	7216.00	35.49	34.48	12.97	38.20	52.18	74.00	21.82	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
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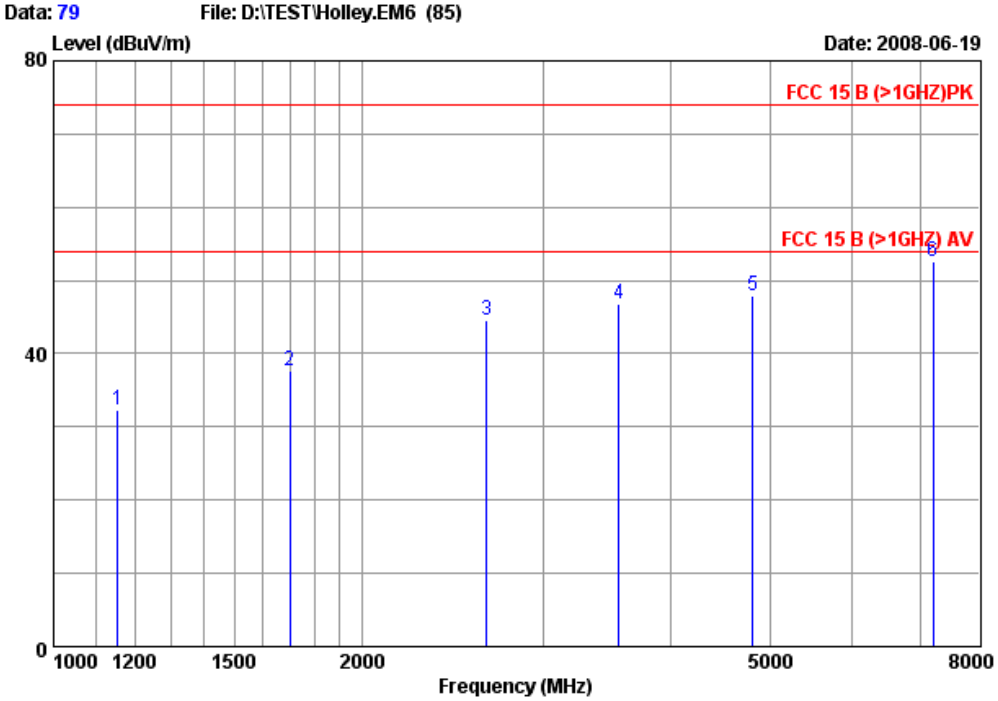


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Site no      : Audix ACI (3m Chamber)          Data no.   : 79
Dis. / Ant.  : 3m   /EMCO3115
Limit        : FCC 15 B (>1GHZ)PK              Ant. pol.  : VERTICAL
Env. / Ins.  : 23*C 54%   / E7405A             Engineer   : Leo
EUT          : 20mW Short-range ZigBee Module
M/N          : HT-MDL-Z-EM-2400-021-X
S/N          : E08061901
Power Rating: DC:3.3V
Test Mode    : Transmitting
Memo         : CH 11(2405MHz)
```

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1154.00	24.83	37.28	7.01	37.71	32.27	74.00	41.73	Peak
2	1700.00	26.78	36.17	8.99	38.11	37.71	74.00	36.29	Peak
3	2645.00	29.61	35.08	11.62	38.41	44.56	74.00	29.44	Peak
4	3562.00	31.76	34.09	12.09	37.08	46.84	74.00	27.16	Peak
5	4808.00	33.25	34.59	12.46	36.69	47.81	74.00	26.19	Peak
6	7216.00	35.49	34.48	12.97	38.50	52.48	74.00	21.52	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

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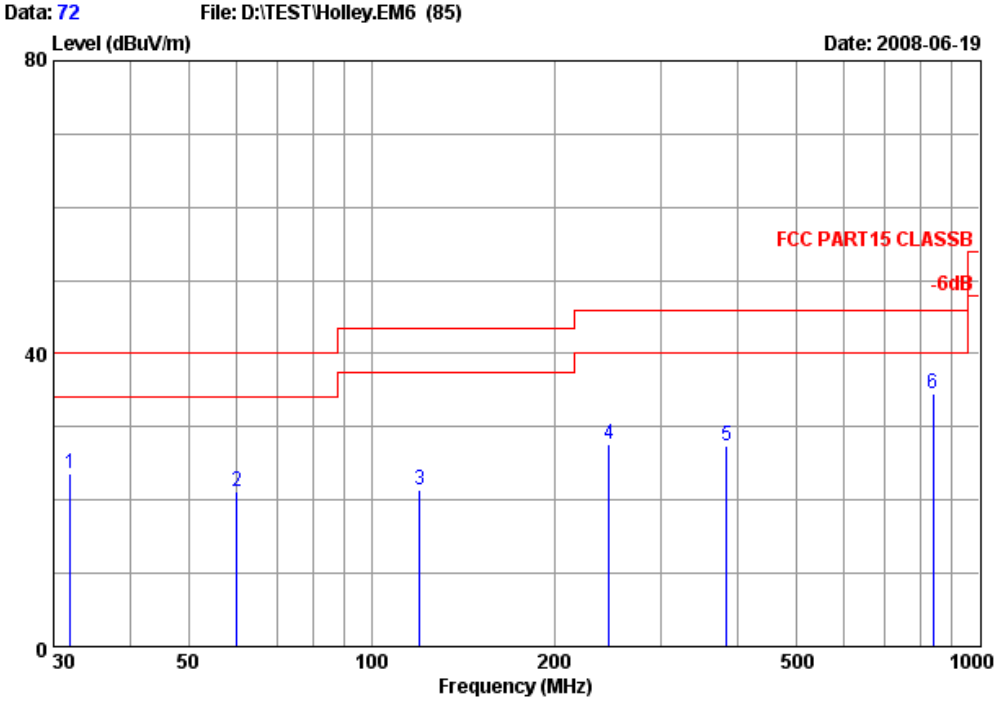
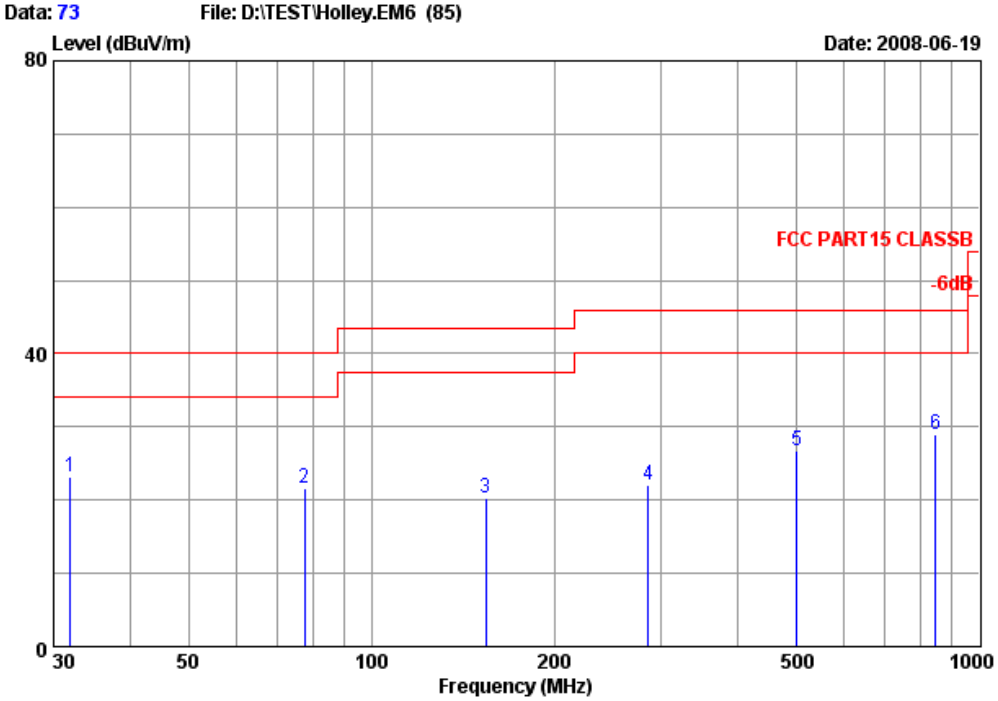


Site no : Audix ACI (3m Chamber) Data no. : 72
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB Ant. pol. : HORIZONTAL
Env. / Ins. : 23*C 54% / ESVS10 Engineer : Leo
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Meno : CH 18(2440MHz)

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	31.94	18.49	0.92	4.17	23.58	40.00	16.42
2	60.07	6.60	1.22	13.35	21.17	40.00	18.83
3	120.21	12.98	1.86	6.64	21.48	43.50	22.02
4	246.31	12.75	2.77	12.16	27.68	46.00	18.32
5	384.05	16.17	3.53	7.63	27.33	46.00	18.67
6	839.95	21.09	5.50	7.97	34.56	46.00	11.44

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



Site no : Audix ACI (3m Chamber) Data no. : 73
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB Ant. pol. : VERTICAL
Env. / Ins. : 23*C 54% / ESVS10 Engineer : Leo
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Meno : CH 18(2440MHz)

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	31.94	15.50	0.00	7.64	23.14	40.00	16.86
2	77.53	12.26	0.00	9.38	21.64	40.00	18.36
3	154.16	11.02	0.00	9.30	20.32	43.50	23.18
4	285.11	13.40	0.00	8.69	22.09	46.00	23.91
5	501.42	20.05	0.00	6.72	26.77	46.00	19.23
6	847.71	23.38	0.00	5.62	29.00	46.00	17.00

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
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Shanghai, China 200233
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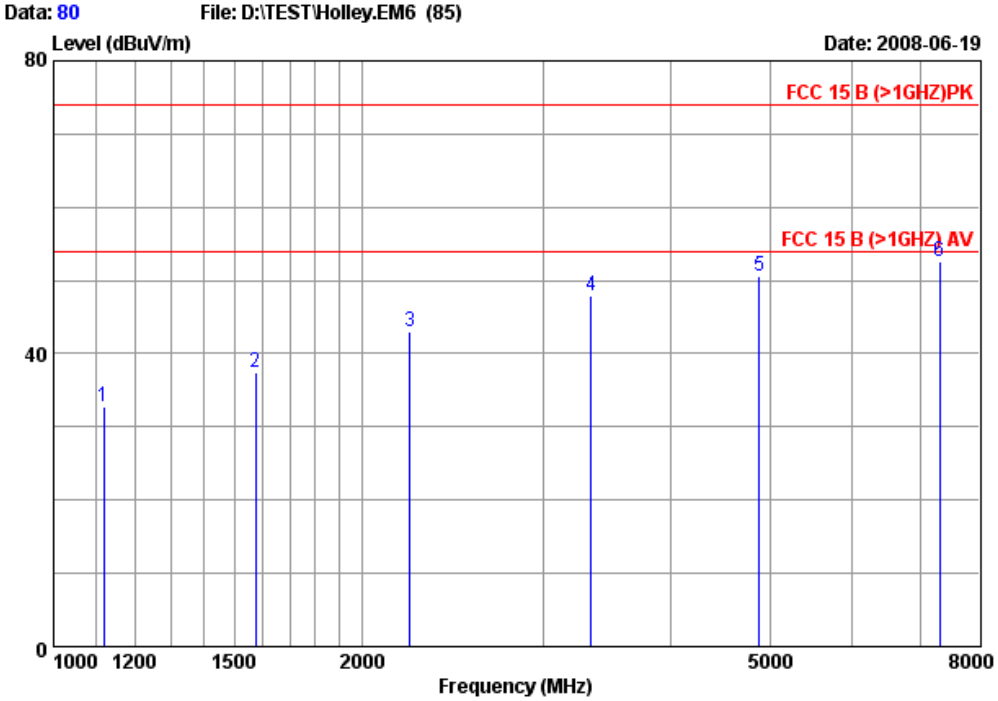
audixaci@audix.com



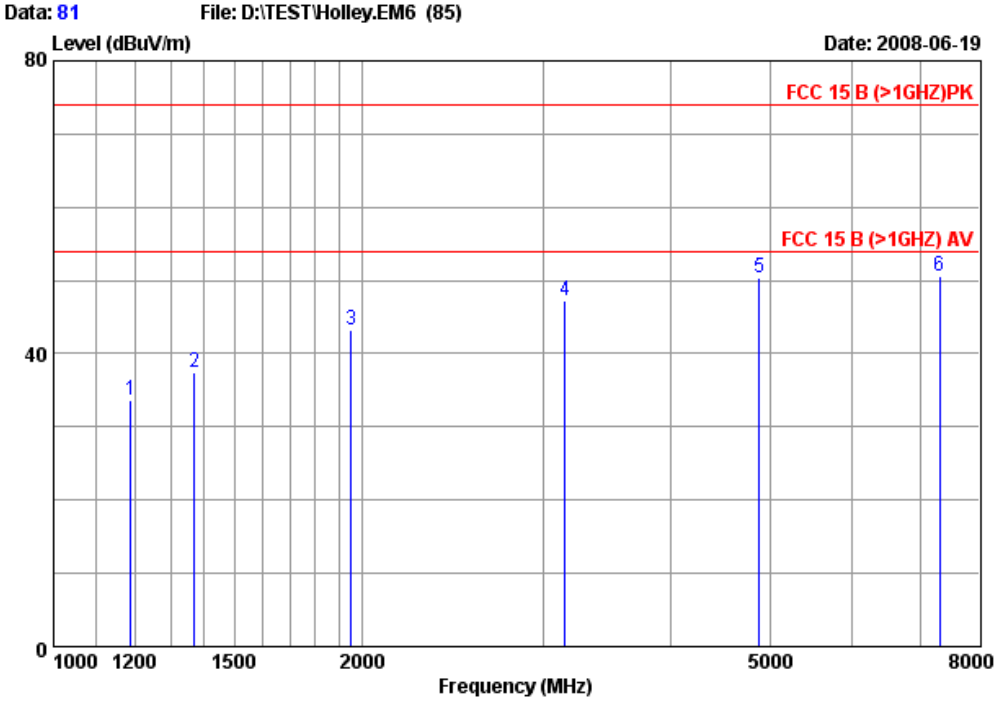
Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Memo : CH 18(2440MHz)

Data no. : 80
Ant. pol. : HORIZONTAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1119.00	24.67	37.37	6.95	38.60	32.85	74.00	41.15	Peak
2	1574.00	26.39	36.39	8.64	38.80	37.44	74.00	36.56	Peak
3	2225.00	28.37	35.46	10.71	39.30	42.92	74.00	31.08	Peak
4	3345.00	31.30	34.35	11.99	39.07	48.01	74.00	25.99	Peak
5	4880.00	33.31	34.67	12.47	39.45	50.56	74.00	23.44	Peak
6	7320.00	35.58	34.47	13.00	38.54	52.65	74.00	21.35	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Memo : CH 18(2440MHz)

Data no. : 81
Ant. pol. : VERTICAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1189.00	24.98	37.20	7.07	38.89	33.74	74.00	40.26	Peak
2	1371.00	25.69	36.79	7.92	40.63	37.45	74.00	36.55	Peak
3	1952.00	27.47	35.77	9.81	41.75	43.26	74.00	30.74	Peak
4	3156.00	30.88	34.59	11.89	39.02	47.20	74.00	26.80	Peak
5	4880.00	33.31	34.67	12.47	39.15	50.26	74.00	23.74	Peak
6	7320.00	35.58	34.47	13.00	36.45	50.56	74.00	23.44	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

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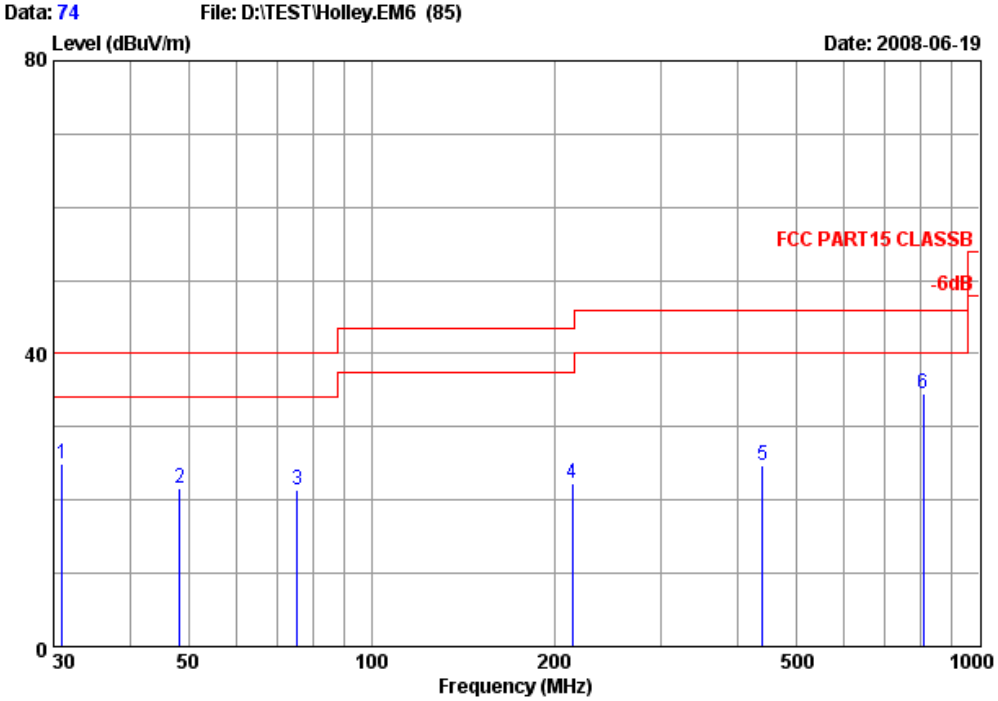
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com

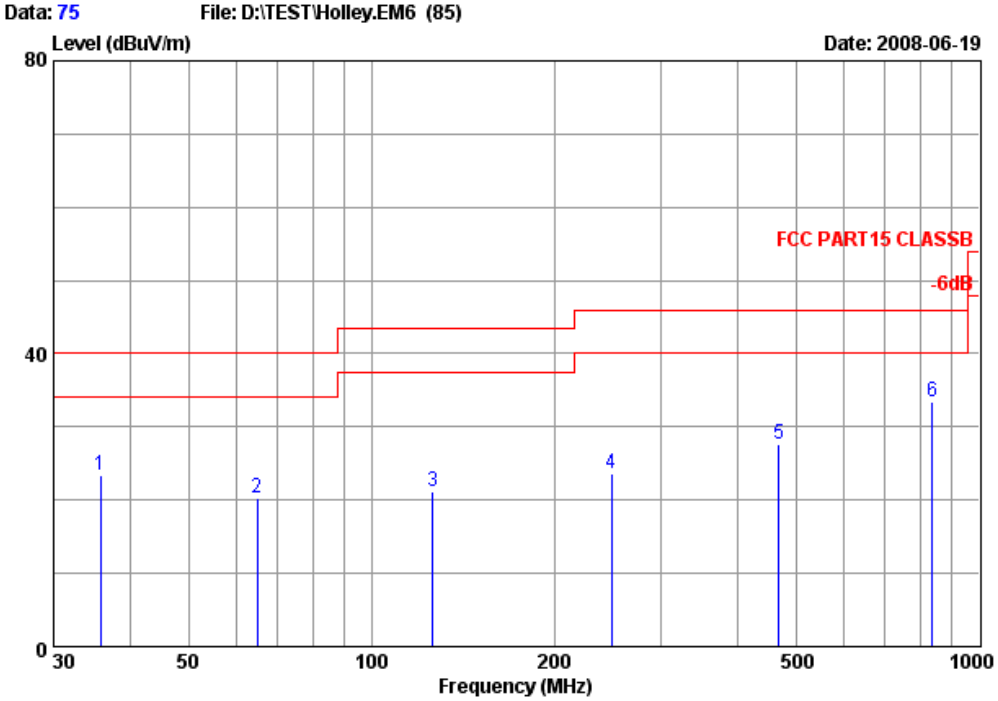


Site no : Audix ACI (3m Chamber) Data no. : 74
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB Ant. pol. : HORIZONTAL
Env. / Ins. : 23*C 54% / ESVS10 Engineer : Leo
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Meno : CH 25(2475MHz)

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	30.97	19.03	0.91	5.04	24.98	40.00	15.02
2	48.43	9.62	0.98	11.11	21.71	40.00	18.29
3	75.59	7.24	1.47	12.71	21.42	40.00	18.58
4	214.30	11.35	2.48	8.43	22.26	43.50	21.24
5	440.31	17.09	3.77	3.89	24.75	46.00	21.25
6	809.88	20.80	5.42	8.31	34.53	46.00	11.47

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com

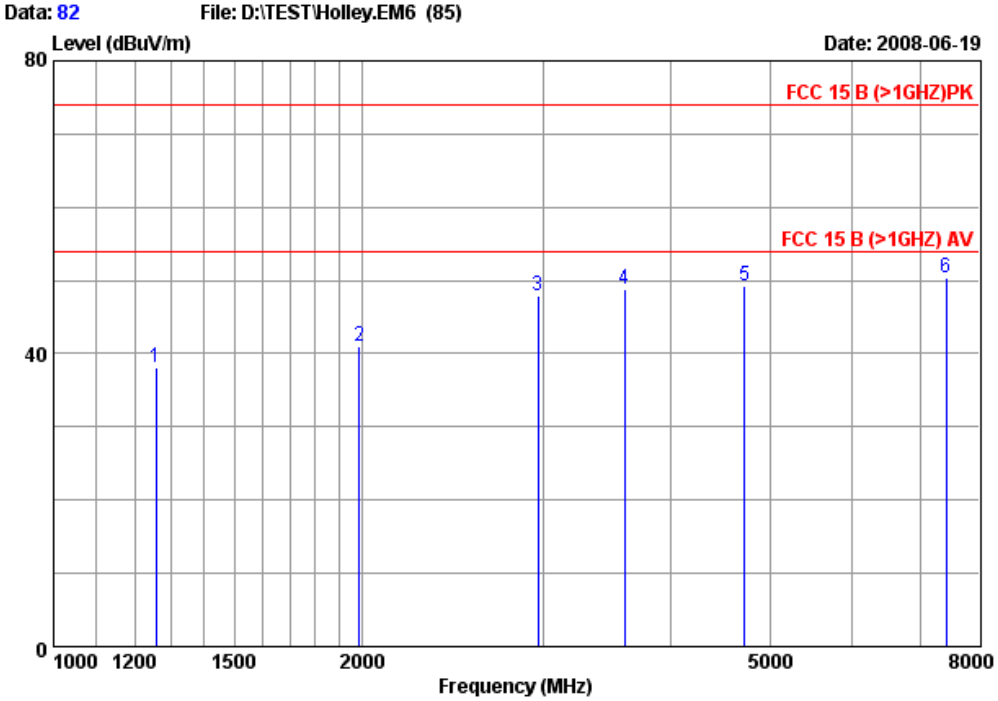


Site no : Audix ACI (3m Chamber) Data no. : 75
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB Ant. pol. : VERTICAL
Env. / Ins. : 23*C 54% / ESVS10 Engineer : Leo
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Meno : CH 25(2475MHz)

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	35.82	10.71	0.00	12.66	23.37	40.00	16.63
2	64.92	11.72	0.00	8.47	20.19	40.00	19.81
3	126.03	12.02	0.00	9.05	21.07	43.50	22.43
4	248.25	13.83	0.00	9.70	23.53	46.00	22.47
5	467.47	19.41	0.00	8.20	27.61	46.00	18.39
6	836.07	23.50	0.00	9.89	33.39	46.00	12.61

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



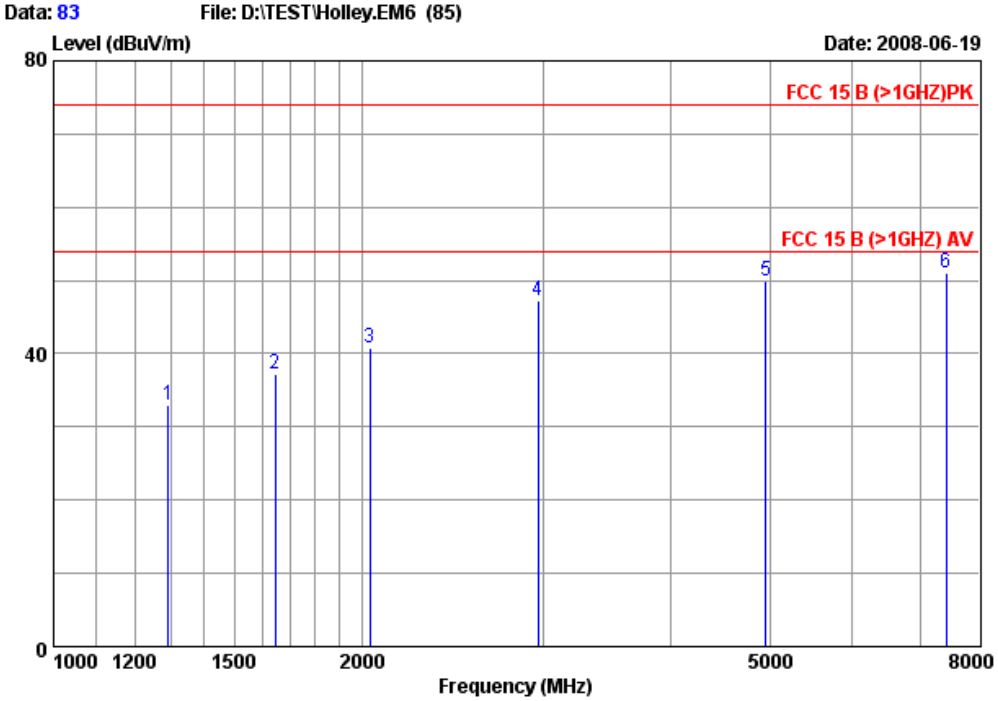
Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Memo : CH 25(2475MHz)

Data no. : 82
Ant. pol. : HORIZONTAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1259.00	25.27	37.03	7.41	42.39	38.04	74.00	35.96	Peak
2	1987.00	27.57	35.72	9.90	39.29	41.04	74.00	32.96	Peak
3	2967.00	30.42	34.83	11.79	40.64	48.02	74.00	25.98	Peak
4	3604.00	31.84	34.04	12.11	38.79	48.70	74.00	25.30	Peak
5	4726.00	33.19	34.49	12.45	38.14	49.29	74.00	24.71	Peak
6	7426.00	35.67	34.46	13.03	36.14	50.38	74.00	23.62	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com

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Site no      : Audix ACI (3m Chamber)          Data no.   : 83
Dis. / Ant.  : 3m    /EMCO3115
Limit        : FCC 15 B (>1GHZ)PK              Ant. pol.  : VERTICAL
Env. / Ins.  : 23*C 54%    / E7405A            Engineer   : Leo
EUT          : 20mW Short-range ZigBee Module
M/N          : HT-MDL-Z-EM-2400-021-X
S/N          : E08061901
Power Rating : DC:3.3V
Test Mode    : Transmitting
Memo         : CH 25(2475MHz)
```
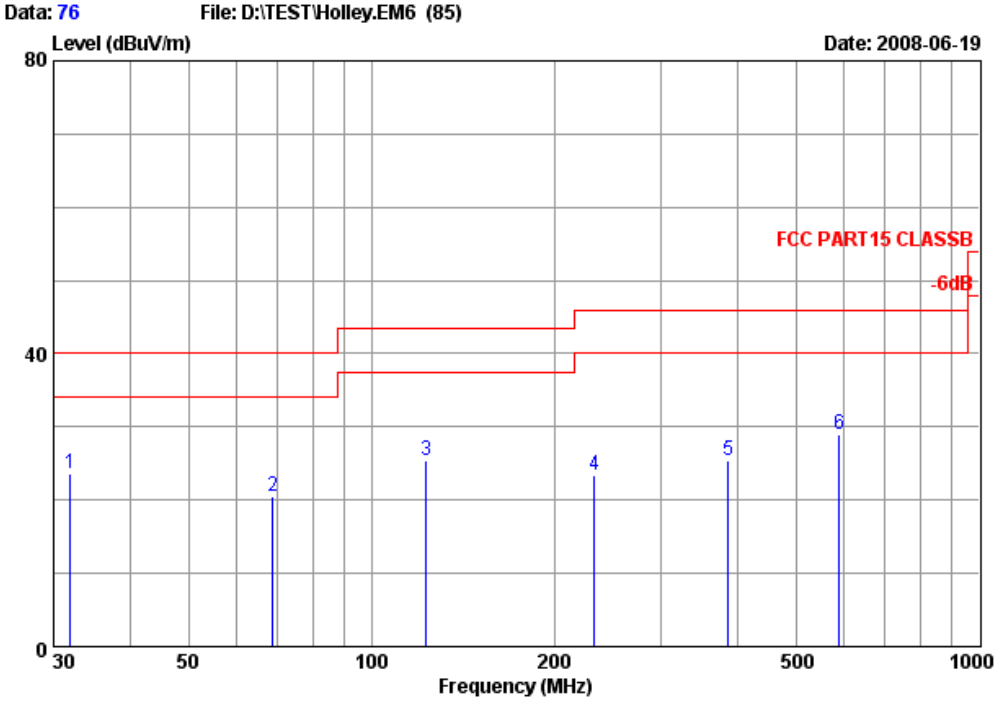

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1294.00	25.40	36.96	7.58	36.86	32.88	74.00	41.12	Peak
2	1644.00	26.61	36.26	8.85	38.11	37.31	74.00	36.69	Peak
3	2036.00	27.72	35.66	10.08	38.66	40.80	74.00	33.20	Peak
4	2967.00	30.42	34.83	11.79	39.80	47.18	74.00	26.82	Peak
5	4950.00	33.36	34.75	12.49	38.80	49.90	74.00	24.10	Peak
6	7425.00	35.67	34.46	13.03	36.80	51.04	74.00	22.96	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



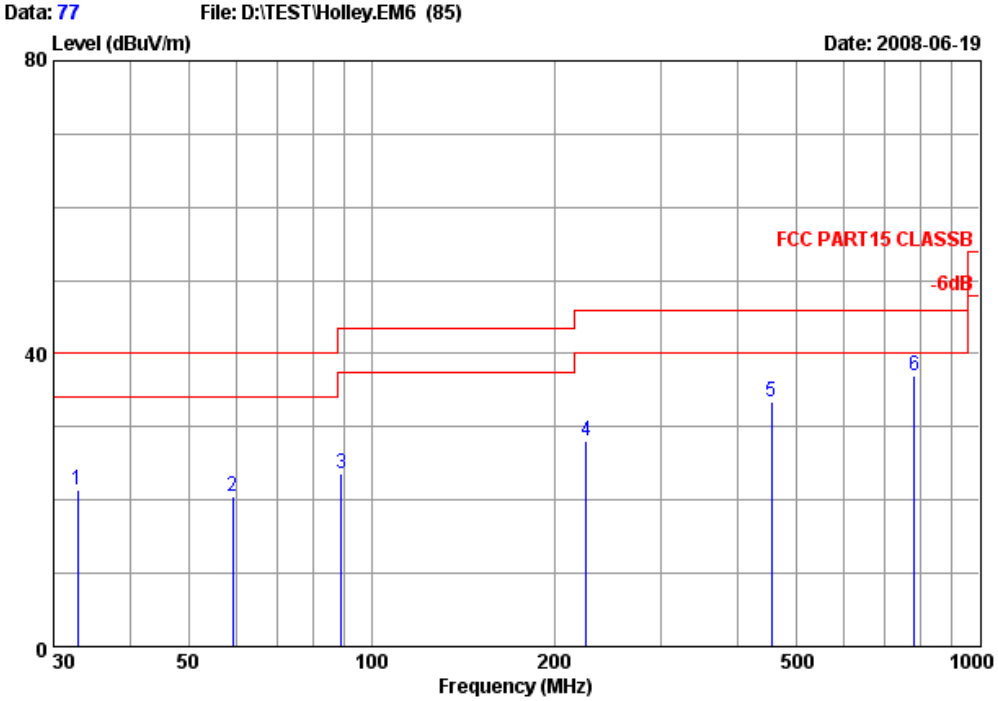
Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB
Env. / Ins. : 23*C 54% / ESVS10
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Receiving
Meno : CH 18(2440MHz)

Data no. : 76
Ant. pol. : HORIZONTAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	31.94	18.49	0.92	4.17	23.58	40.00	16.42
2	68.80	6.51	1.39	12.51	20.41	40.00	19.59
3	123.12	12.86	1.89	10.57	25.32	43.50	18.18
4	232.73	12.24	2.64	8.62	23.50	46.00	22.50
5	385.99	16.20	3.55	5.59	25.34	46.00	20.66
6	587.75	19.06	4.20	5.72	28.98	46.00	17.02

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com

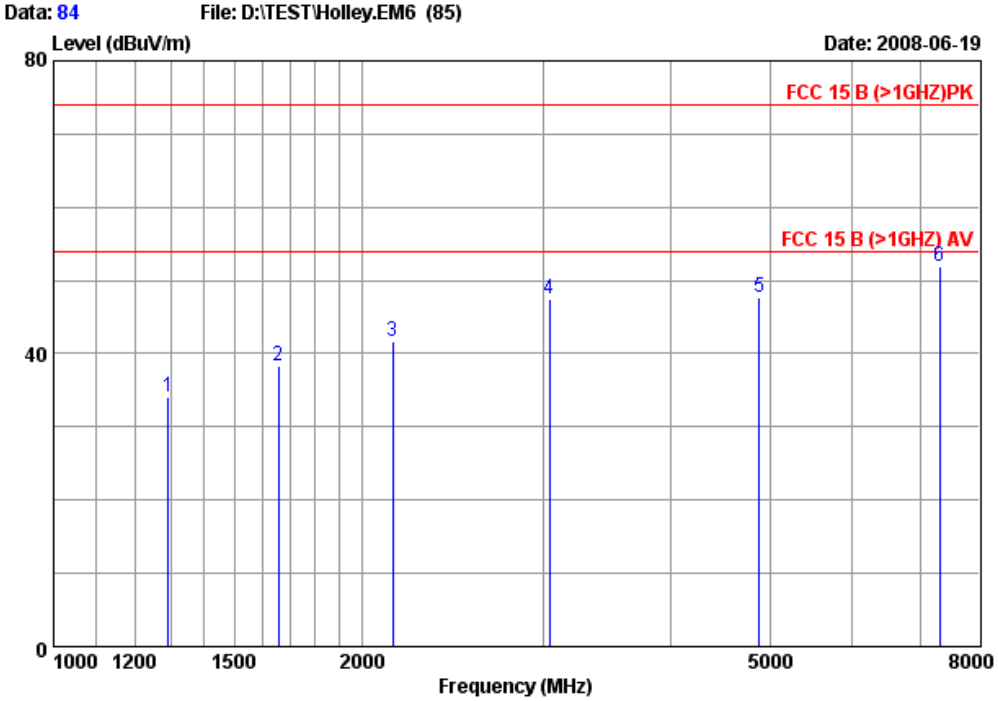


Site no : Audix ACI (3m Chamber) Data no. : 77
Dis. / Ant. : 3m /CBL 6112D-2007.08.16
Limit : FCC PART15 CLASSB Ant. pol. : VERTICAL
Env. / Ins. : 23*C 54% / ESVS10 Engineer : Leo
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Receiving
Meno : CH 18(2440MHz)

	Freq. (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)
1	32.91	14.38	0.92	6.06	21.36	40.00	18.64
2	59.10	10.85	1.20	8.42	20.47	40.00	19.53
3	89.17	10.99	1.60	11.03	23.62	43.50	19.88
4	225.94	13.51	2.58	11.94	28.03	46.00	17.97
5	455.83	19.18	3.84	10.36	33.38	46.00	12.62
6	782.72	23.47	5.28	8.25	37.00	46.00	9.00

Remarks: 1.Emission Level= Antenna Factor + Cable Loss + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Receiving
Memo : CH 18(2440MHz)

Data no. : 84
Ant. pol. : HORIZONTAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1294.00	25.40	36.96	7.58	38.17	34.19	74.00	39.81	Peak
2	1658.00	26.65	36.24	8.92	38.90	38.23	74.00	35.77	Peak
3	2141.00	28.08	35.55	10.40	38.70	41.63	74.00	32.37	Peak
4	3044.00	30.60	34.74	11.84	39.69	47.39	74.00	26.61	Peak
5	4880.00	33.31	34.67	12.47	36.68	47.79	74.00	26.21	Peak
6	7320.00	35.58	34.47	13.00	37.78	51.89	74.00	22.11	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
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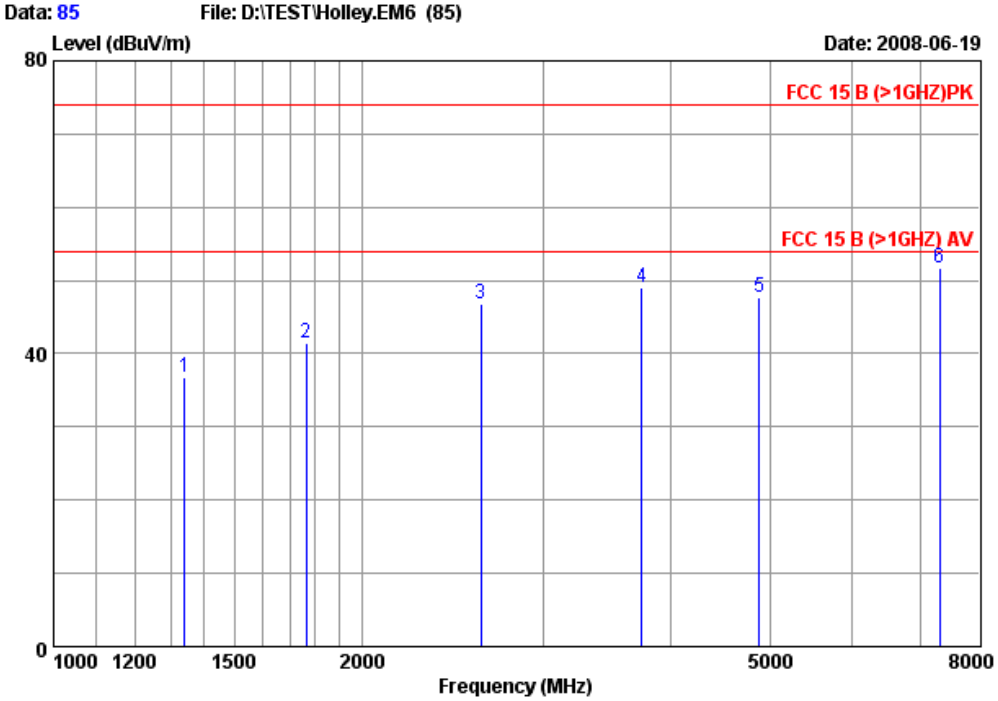
audixaci@audix.com



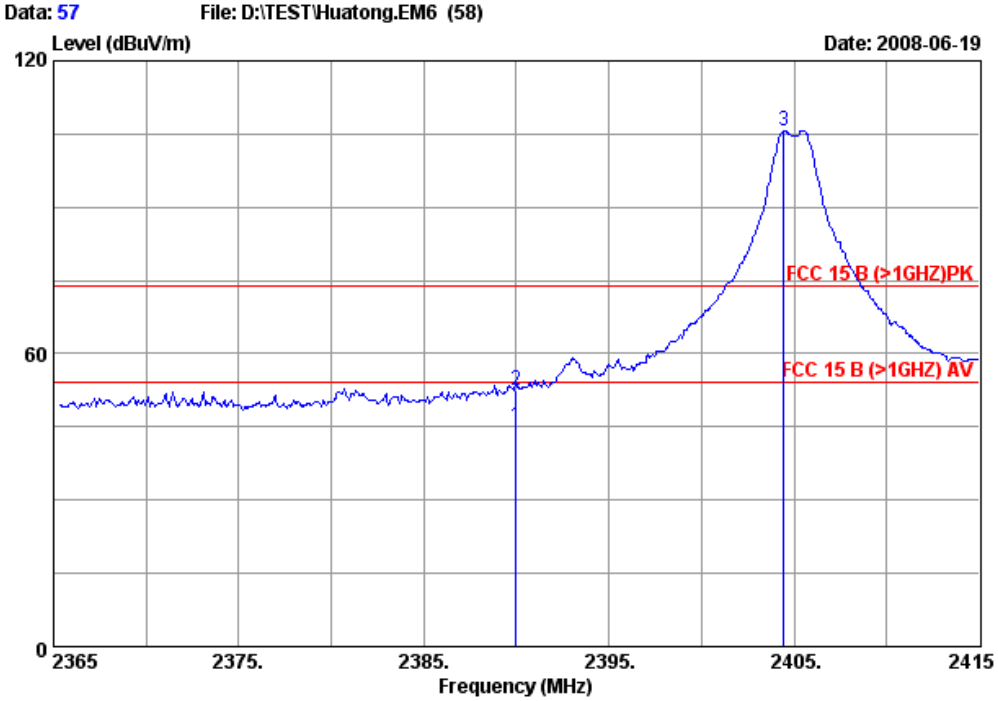
Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Receiving
Memo : CH 18(2440MHz)

Data no. : 85
Ant. pol. : VERTICAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	1343.00	25.59	36.85	7.75	40.23	36.72	74.00	37.28	Peak
2	1763.00	26.96	36.06	9.24	41.39	41.53	74.00	32.47	Peak
3	2610.00	29.51	35.11	11.60	40.74	46.74	74.00	27.26	Peak
4	3751.00	32.12	33.88	12.19	38.68	49.11	74.00	24.89	Peak
5	4880.00	33.31	34.67	12.47	36.68	47.79	74.00	26.21	Peak
6	7320.00	35.58	34.47	13.00	37.56	51.67	74.00	22.33	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



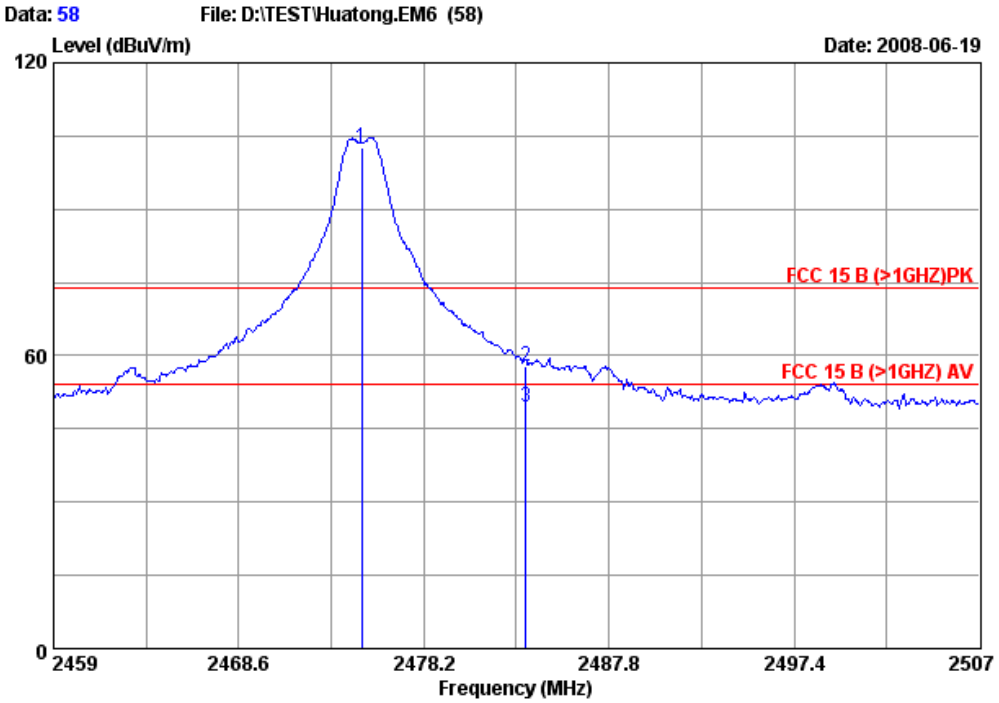
Site no : Audix ACI (3m Chamber)
Dis. / Ant. : 3m /EMCO3115
Limit : FCC 15 B (>1GHZ)PK
Env. / Ins. : 23*C 54% / E7405A
EUT : 20mW Short-range ZigBee Module
M/N : HT-MDL-Z-EM-2400-021-X
S/N : E08061901
Power Rating: DC:3.3V
Test Mode : Transmitting
Memo : CH 11(2400MHz)

Data no. : 57
Ant. pol. : VERTICAL
Engineer : Leo

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2390.00	28.86	35.30	11.23	40.44	45.23	54.00	8.77	Average
2	2390.00	28.86	35.30	11.23	47.58	52.37	74.00	21.63	Peak
3	2404.43	28.93	35.29	11.23	100.73	105.60	74.00	-31.60	Peak

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

Audix Technology (Shanghai) Co., Ltd.
3F #34Bldg. No.680 GuiPing Rd.,
CaoHeJing Hi-Tech Park,
Shanghai, China 200233
Tel:+86-21-64955500 Fax:+86-21-64955491
audixaci@audix.com



Site no	: Audix ACI (3m Chamber)	Data no.	: 58
Dis. / Ant.	: 3m /EMCO3115		
Limit	: FCC 15 B (>1GHZ)PK	Ant. pol.	: VERTICAL
Env. / Ins.	: 23*C 54% / E7405A	Engineer	: Leo
EUT	: 20mW Short-range ZigBee Module		
M/N	: HT-MDL-Z-EM-2400-021-X		
S/N	: E08061901		
Power Rating	: DC:3.3V		
Test Mode	: Transmitting		
Memo	: CH 25(2475MHz)		

	Freq. (MHz)	Antenna Factor (dB/m)	Preamp Factor (dB)	Cable Loss (dB)	Reading (dBuV)	Emission Level (dBuV/m)	Limits (dBuV/m)	Margin (dB)	Remark
1	2475.00	29.13	35.22	11.44	97.25	102.60	74.00	-28.60	Peak
2	2483.50	29.15	35.22	11.44	52.47	57.84	74.00	16.16	Peak
3	2483.50	29.15	35.22	11.44	44.10	49.47	54.00	4.53	Average

Remarks: 1.Emission Level= Antenna Factor + Cable Loss - Preamp Factor + Reading.
2.The emission levels that are 20dB below the offical are not report.

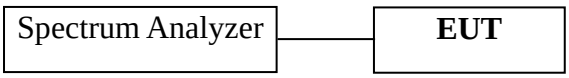
4 6 dB BANDWIDTH MEASUREMENT

4.1 Test Equipment

The following test equipment was used during the Emission Bandwidth measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E7405A	MY45106600	Apr 06, 2008	Apr 06, 2009

4.2 Block Diagram of Test Setup



4.3 Specification Limits (§15.247(a)(2))

The minimum 6 dB bandwidth shall be at least 500 kHz.

4.4 Operating Condition of EUT

The test program “Super Terminal” was used to enable the EUT to transmit and receive data at different channel frequency individually.

4.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100 kHz RBW and 100 kHz VBW. The 6 dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6 dB.

4.6 Test Results

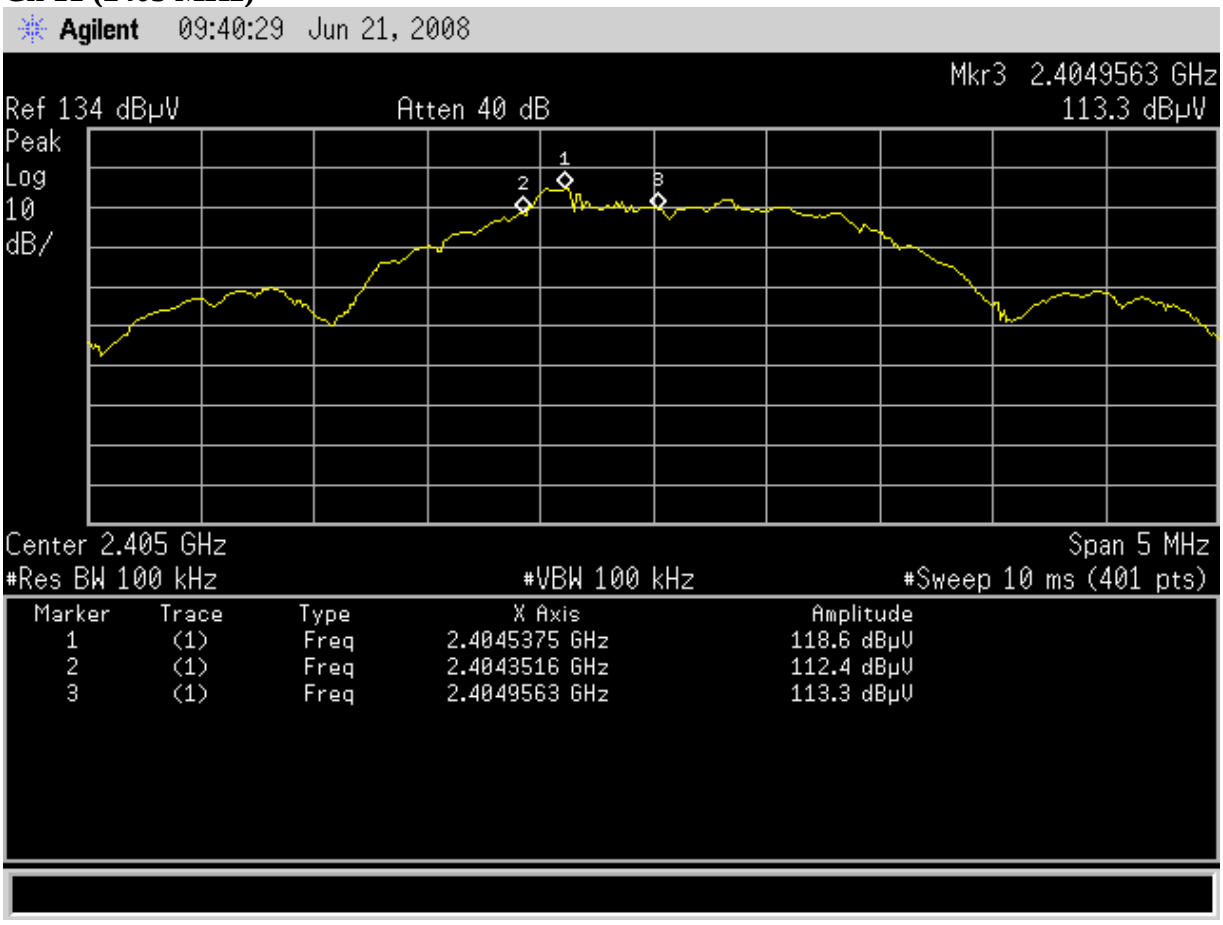
PASSED.

All the test results are attached in next pages.

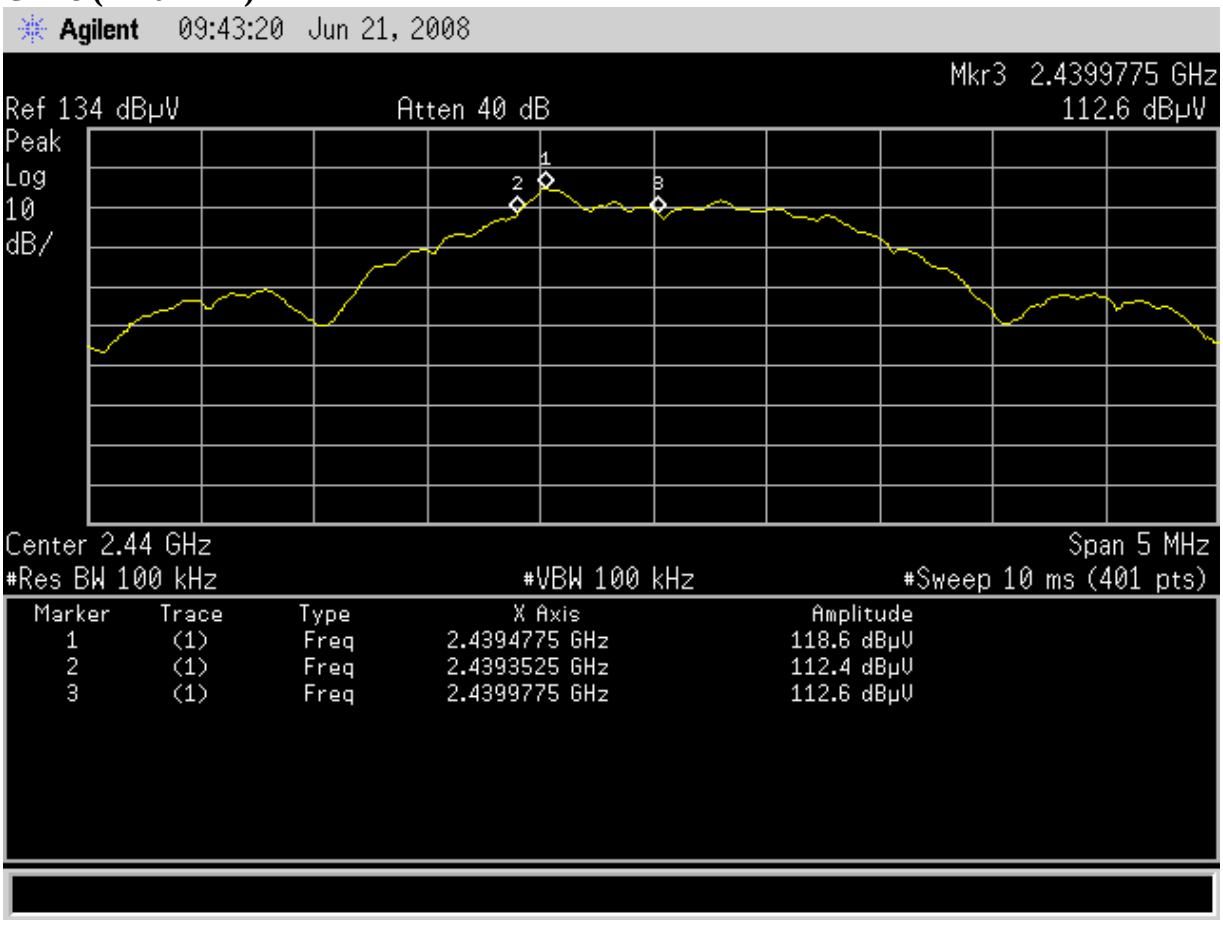
(Test Date : Jun 21, 2008 Temperature : 25℃ Humidity : 54 %)

Channel	Frequency	**6dB Bandwidth**
11	2405 MHz	**604.7 kHz**
18	2440 MHz	**625 kHz**
25	2475 MHz	**575 kHz**

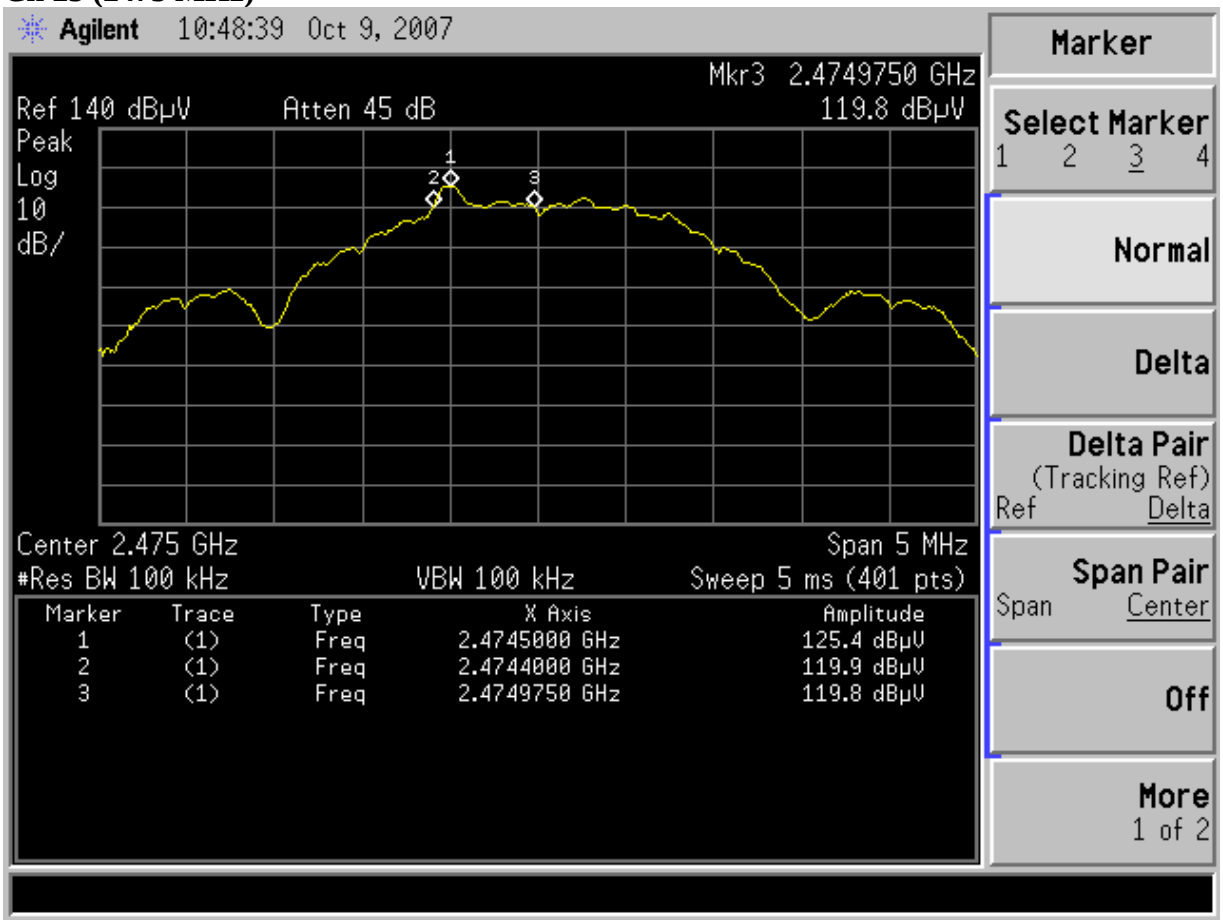
Ch 11 (2405 MHz)



Ch 18 (2440 MHz)



Ch 25 (2475 MHz)



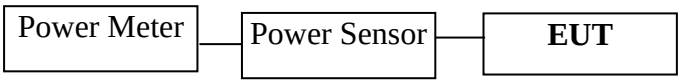
5 MAXIMUM PEAK OUTPUT POWER MEASUREMENT

5.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Power Meter	Anritsu	ML2487A	6K00003245	Aug 05, 2007	Aug 05, 2008
2.	Power Sensor	Anritsu	MA2491A	32489	Aug 05, 2007	Aug 05, 2008

5.2 Block Diagram of Test Setup



5.3 Specification Limits (§15.247(b)(3))

The Limits of maximum Peak Output Power for digital modulation in 2400-2483.5 MHz is: 1 Watt. (30 dBm)

5.4 Operating Condition of EUT

The test program “Super Terminal” was used to enable the EUT to transmit and receive data at different channel frequency individually.

5.5 Test Procedure

The transmitter output was connected to the power meter that was designed to detect peak value automatically.

5.6 Test Results

PASSED. All the test results are listed below.

(Test date: Jun 20, 2008 Temperature : 24 ℃ Humidity : 50 %)

Channel	Frequency	**Peak Output Power**	Limit
11	2405 MHz	**13.15 dBm**	30 dBm
18	2440 MHz	**12.77 dBm**	30 dBm
25	2475 MHz	**12.50 dBm**	30 dBm

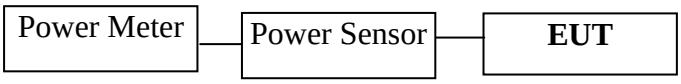
6 RF EXPOSURE MEASUREMENT

6.1 Test Equipment

The following test equipment was used during the maximum peak output power measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Power Meter	Anritsu	ML2487A	6K00003245	Aug 05, 2007	Aug 05, 2008
2.	Power Sensor	Anritsu	MA2491A	32489	Aug 05, 2007	Aug 05, 2008

6.2 Block Diagram of Test Setup



6.3 Specification Limits (§15.247(i), §1.1310)

The criteria listed in the following table shall be used to evaluate the environmental impact of human exposure to radio-frequency (RF) radiation as specified in 1.1307(b)

LIMITS FOR MAXIMUM PERMISSIBLE EXPOSURE (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Average Time (minutes)
(A)LIMITS FOR OCCUPATIONAL / CONTROL EXPOSURES				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B)LIMITS FOR GENERAL POPULATION / UNCONTROLLED EXPOSURE				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1.0	30

F = Frequency in MHz

6.4 Operating Condition of EUT

The test program “Super Terminal” was used to enable the EUT to transmit and receive data at different channel frequency individually.

6.5 Test Procedure

The transmitter output was connected to the power meter that was designed to detect peak value automatically.

6.6 Test Results

PASSED. All the test results are listed below.

(Test date: Jun 20, 2008 Temperature : 24 ℃ Humidity : 50 %)

Channel	Frequency (MHz)	Output Power to Antenna (mW)	Power Density (mW/cm^2)	Limit (mW/cm^2)
11	2405	20.65	0.0066	1.0
18	2440	18.92	0.0061	1.0
25	2475	17.78	0.0057	1.0

Note: $S = \frac{P \cdot G}{4 \cdot \pi \cdot r^2}$

Where S = Power Density in mW/cm^2

P = Output Power to Antenna in mW (See Section 5.6)

G = Antenna Gain in numerical (G = 2.1 dBi = 1.62)

r = 20cm

7 EMISSION LIMITATIONS MEASUREMENT

7.1 Test Equipment

The following test equipment was used during the emission limitations test：

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E7405A	MY45106600	Apr 06, 2008	Apr 06, 2009

7.2 Block Diagram of Test Setup

The same as Section. 4.2.

7.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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. Attenuation below the general limits specified in Section 15.209(a) is not required. In addition, radiated emissions which fall in restricted bands, as defined in Section 15.205(a), must also comply with the radiated emission limits specified in Section 15.209(a) (See Section 15.205(c)).(※This test result attaching to Section. 4.7)

7.4 Operating Condition of EUT

The test program “Super Terminal” was used to enable the EUT to transmit and receive data at different channel frequency individually.

7.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measure by spectrum analyzer with 100 kHz RBW and 100 kHz VBW.

7.6 Test Results

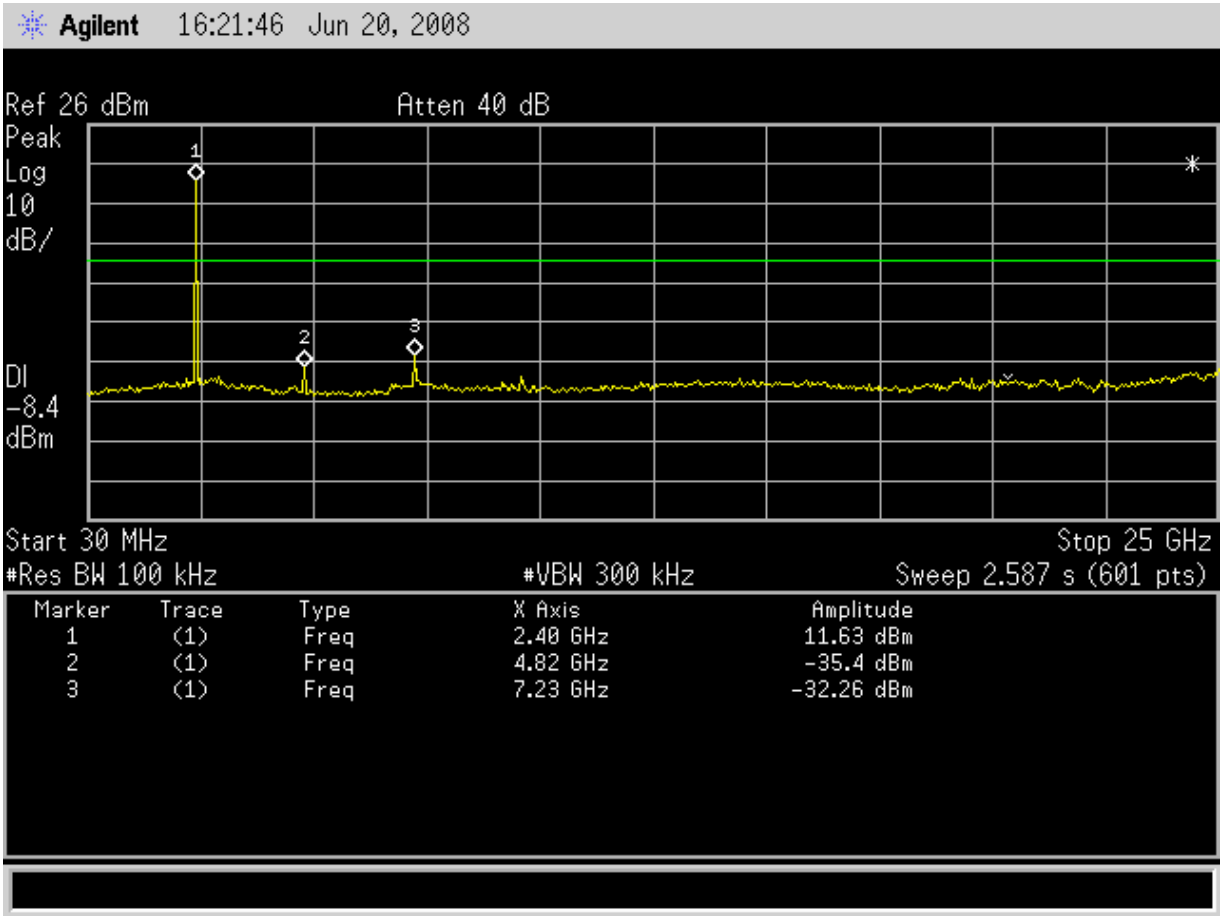
PASSED. The testing data was attached in the next pages.

(Test date: Jun 20, 2008 Temperature : 24 ℃ Humidity : 50 %)

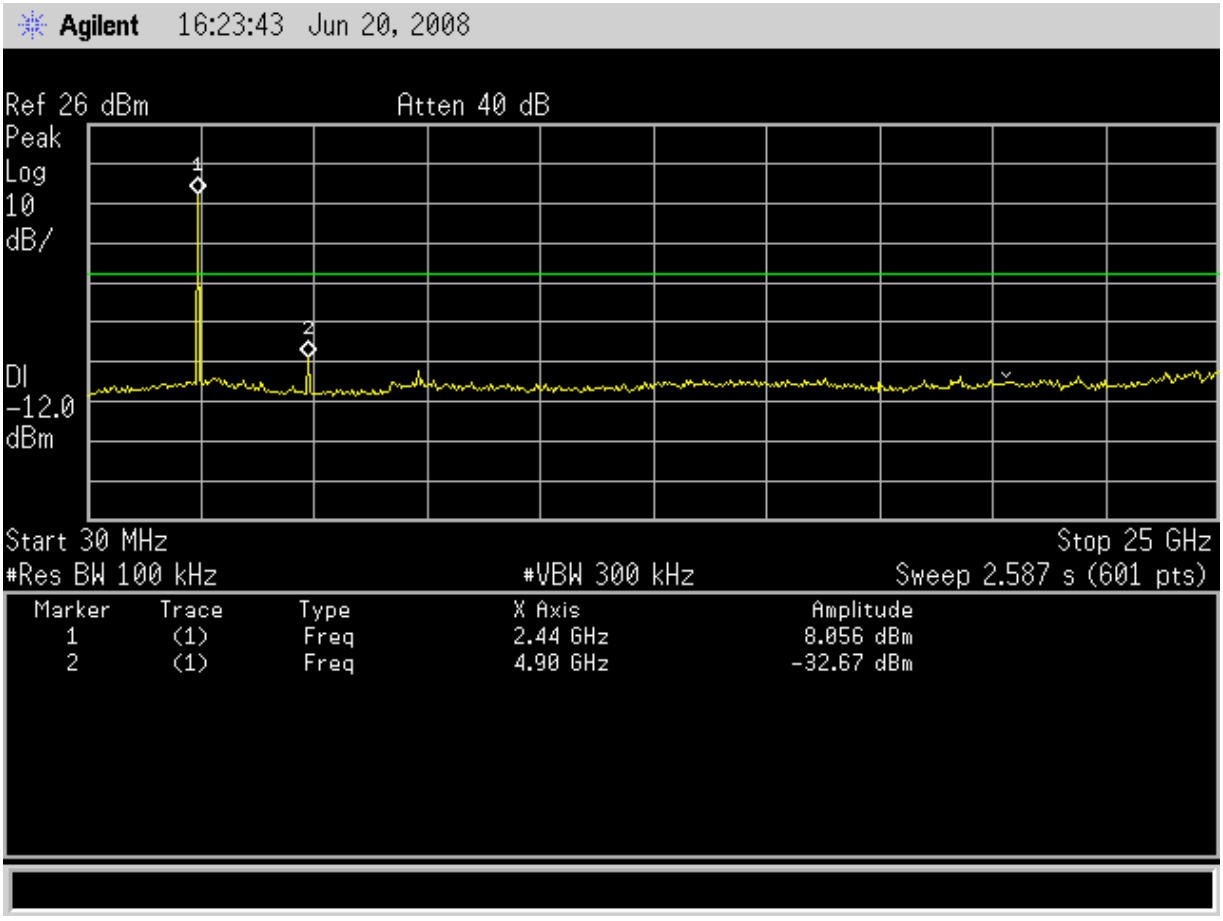
Channel	Highest level of desired power (dBm)	Max Value			Limit (dB)
		Freq. (GHz)	Level (dBm)	Result (dB)	
11	11.63	7.23	-32.26	43.89	20
18	8.05	4.90	-32.67	40.72	20
25	7.79	4.98	-33.52	41.31	20

Note: The peak above the limit line is the carrier frequency.

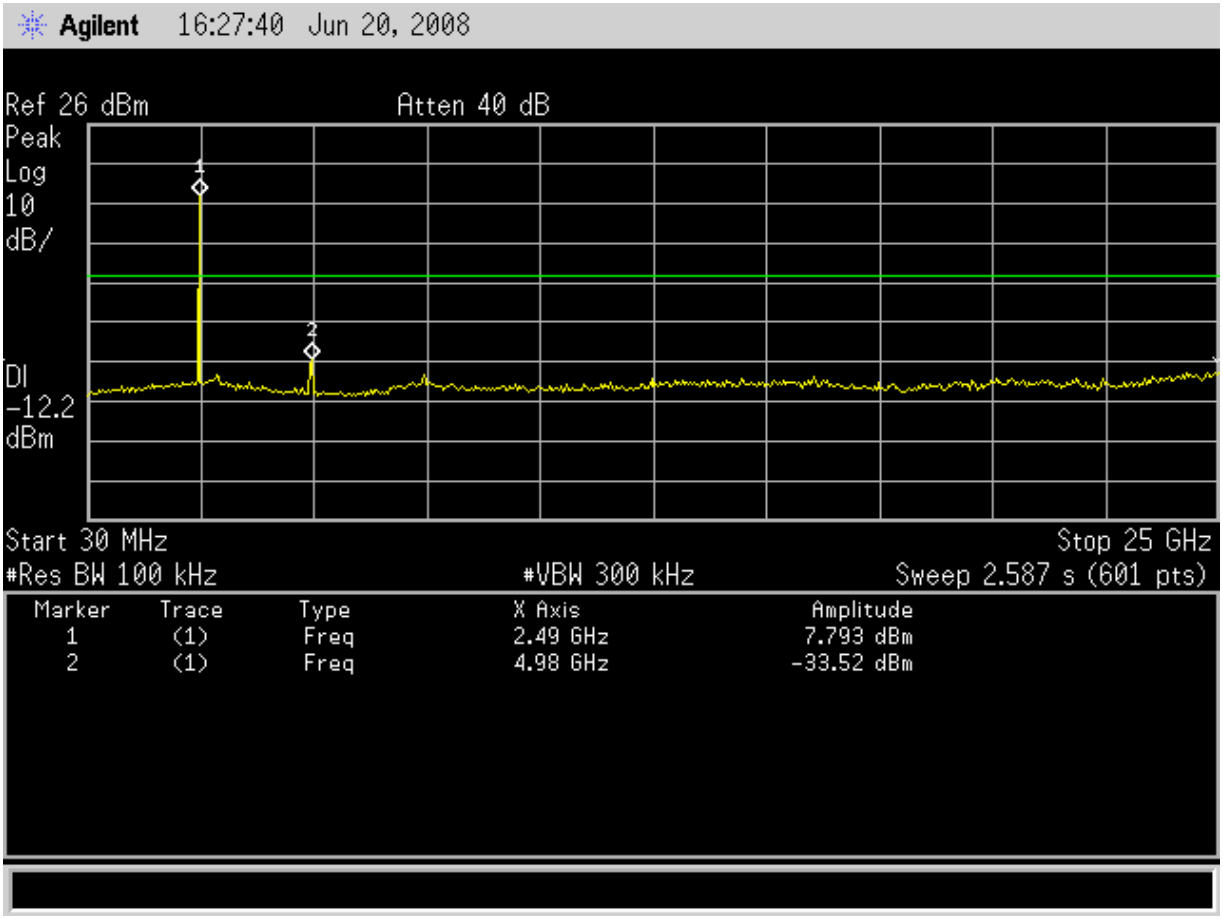
Ch11 2405 MHz



Ch18 2440 MHz



Ch25 2475 MHz



8 BAND EDGES MEASUREMENT

8.1 Test Equipment

The following test equipment was used during the band edges measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E7405A	MY45106600	Apr 06, 2008	Apr 06, 2009

8.2 Block Diagram of Test Setup

The same as section.4.2.

8.3 Specification Limits (§15.247(d))

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits.

8.4 Operating Condition of EUT

The test program "Super Terminal" was used to enable the EUT to transmit and receive data at different channel frequency individually.

8.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. Set both RBW and VBW of spectrum analyzer to 100kHz with suitable frequency span including 100kHz bandwidth from band edge.

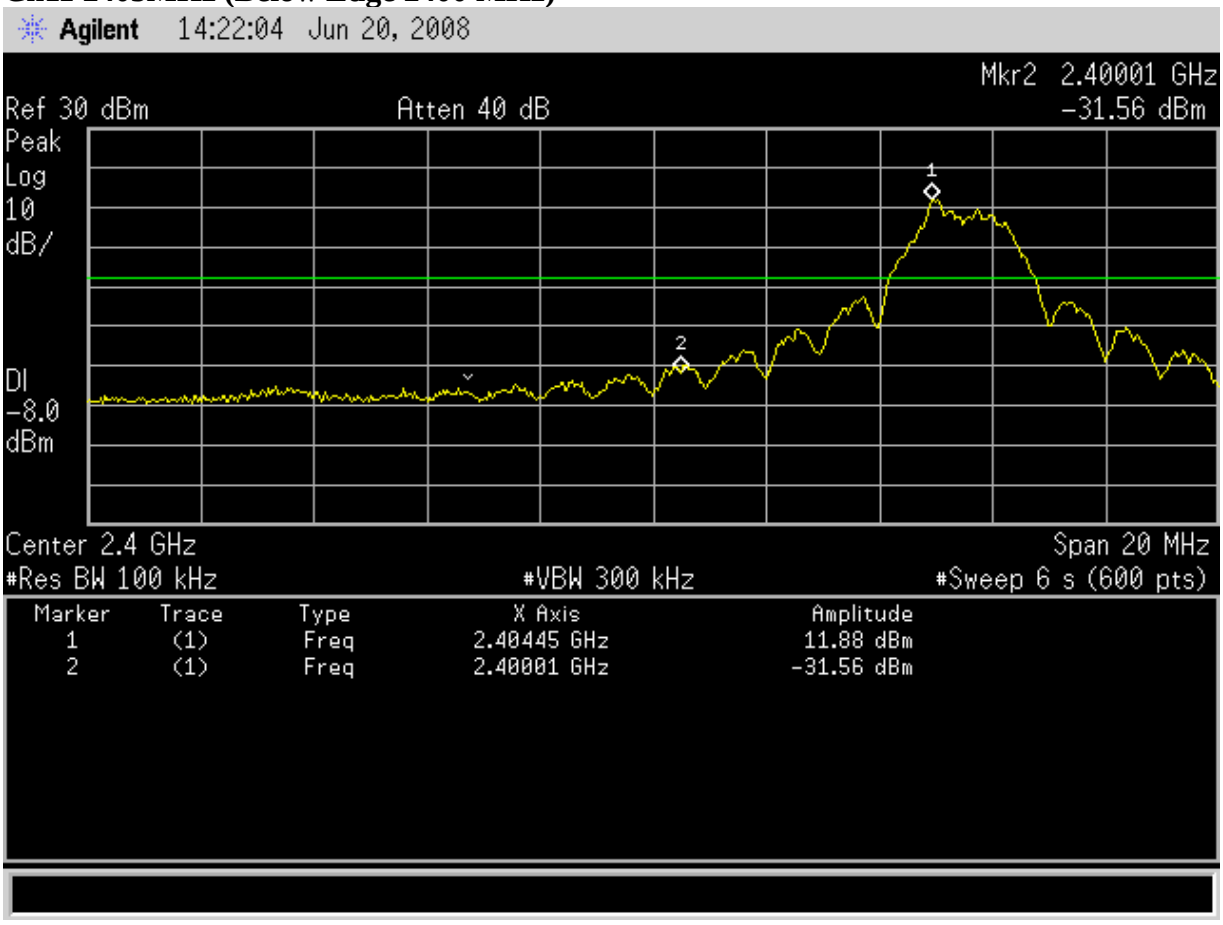
8.6 Test Results

PASSED. All the test results are attached in next pages.

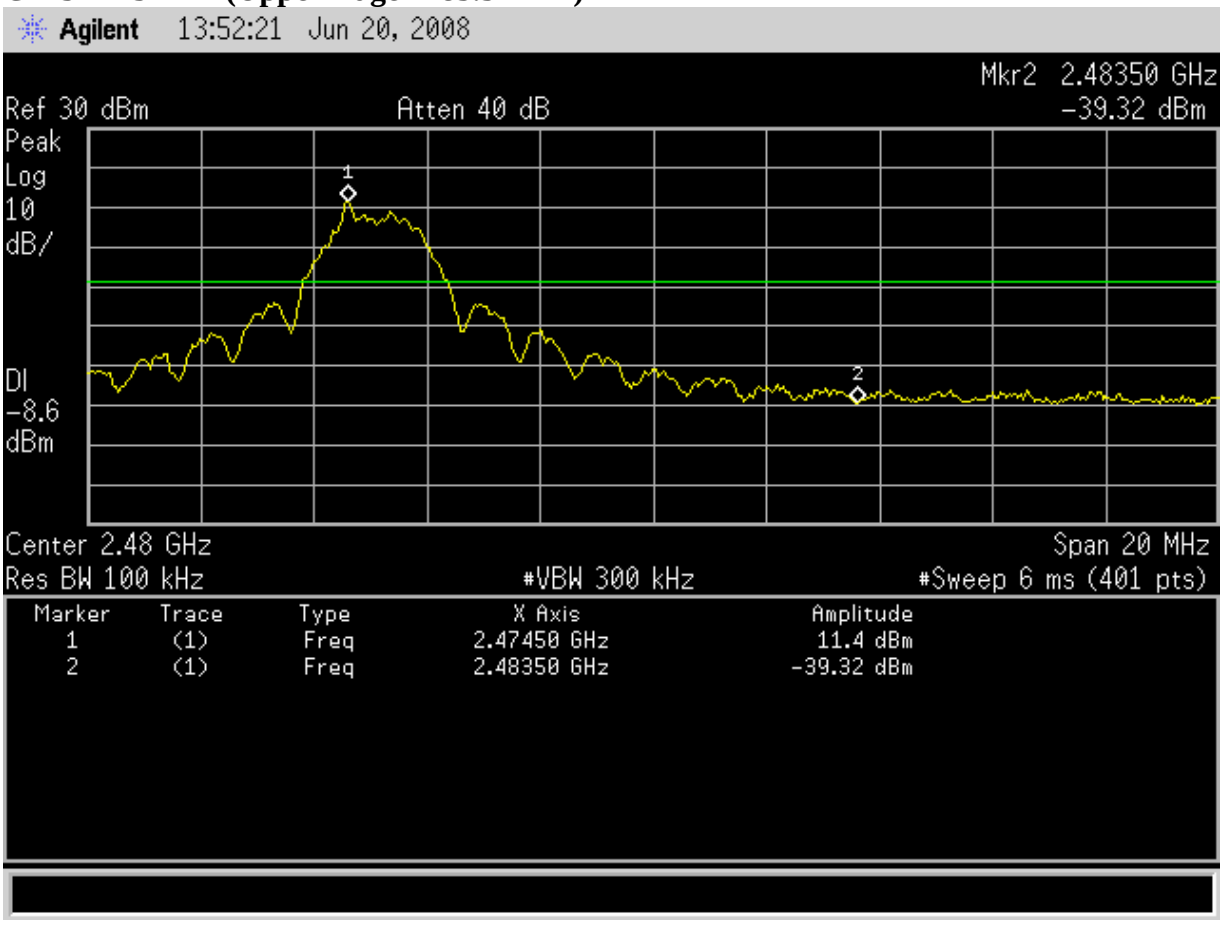
(Test date: Jun 20, 2008 Temperature : 24℃ Humidity : 50 %)

	Channel	Frequency	**Delta Marker**	result
Below Band Edge	11	2400 MHz	**43.44 dB**	More than **20 dB** below the highest level of the desired power
Upper Band Edge	25	2483.5 MHz	**50.72 dB**	

Ch11 2405MHz (Below Edge 2400 MHz)



Ch25 2475MHz (Upper Edge 2483.5 MHz)



9 POWER SPECTRAL DENSITY MEASUREMENT

9.1 Test Equipment

The following test equipment was used during the power spectral density measurement:

Item	Type	Manufacturer	Model No.	Serial No.	Last Cal.	Next Cal.
1.	Spectrum Analyzer	Agilent	E7405A	MY45106600	Apr 06, 2008	Apr 06, 2009

9.2 Block Diagram of Test Setup

The same as section.4.2.

9.3 Specification Limits (§15.247(e))

The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band.

9.4 Operating Condition of EUT

The test program "Super Terminal" was used to enable the EUT to transmit and receive data at different channel frequency individually.

9.5 Test Procedure

The transmitter output was connected to the spectrum analyzer. The bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3 kHz RBW and 30 kHz VBW, set sweep time = span/3 kHz.

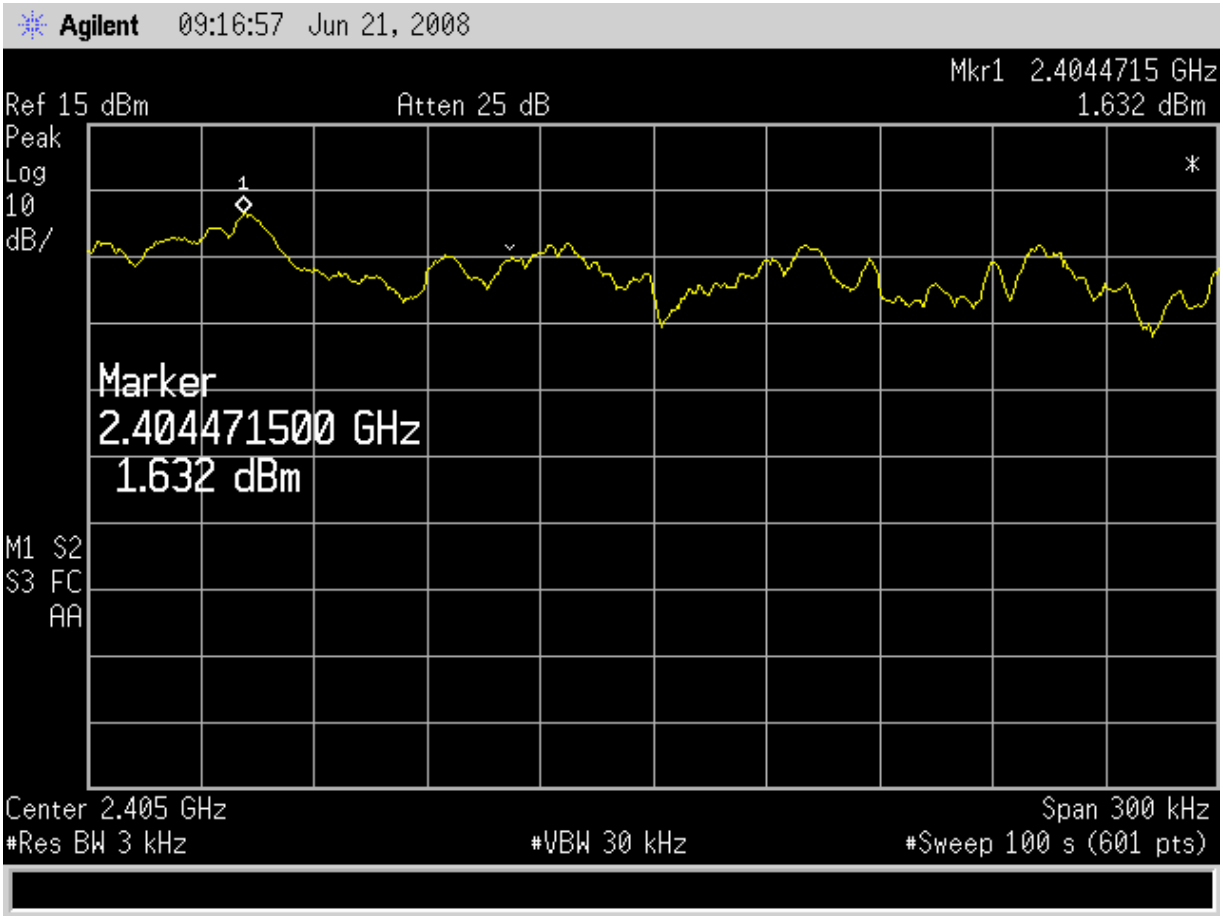
9.6 Test Results

PASSED. All the test results are attached in next pages.

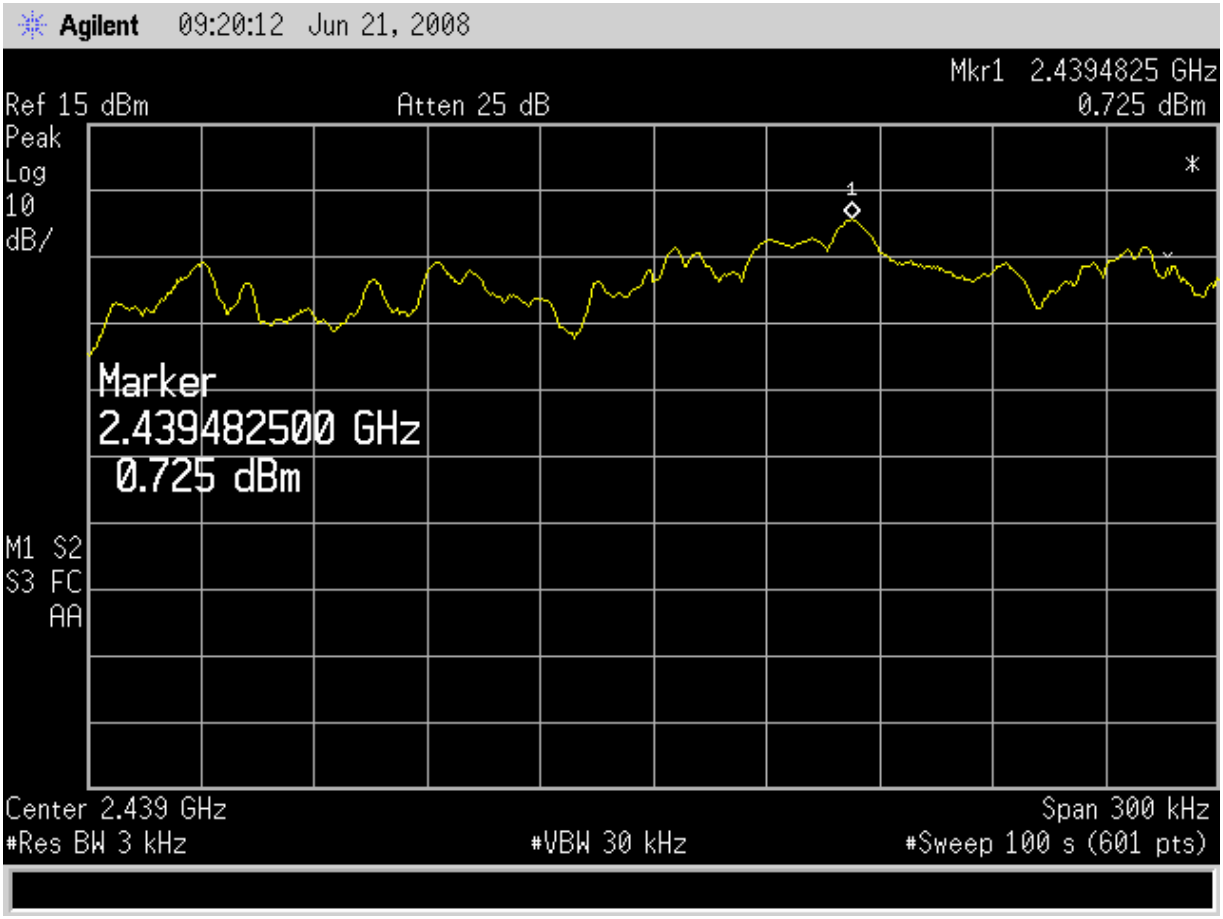
(Test date: Jun 21, 2008 Temperature : 25℃ Humidity : 54 %)

Channel	Frequency	Power Spectral Density	Limit
11	2405 MHz	1.632 dBm	8dBm
18	2440 MHz	0.725 dBm	8dBm
25	2475 MHz	1.222 dBm	8dBm

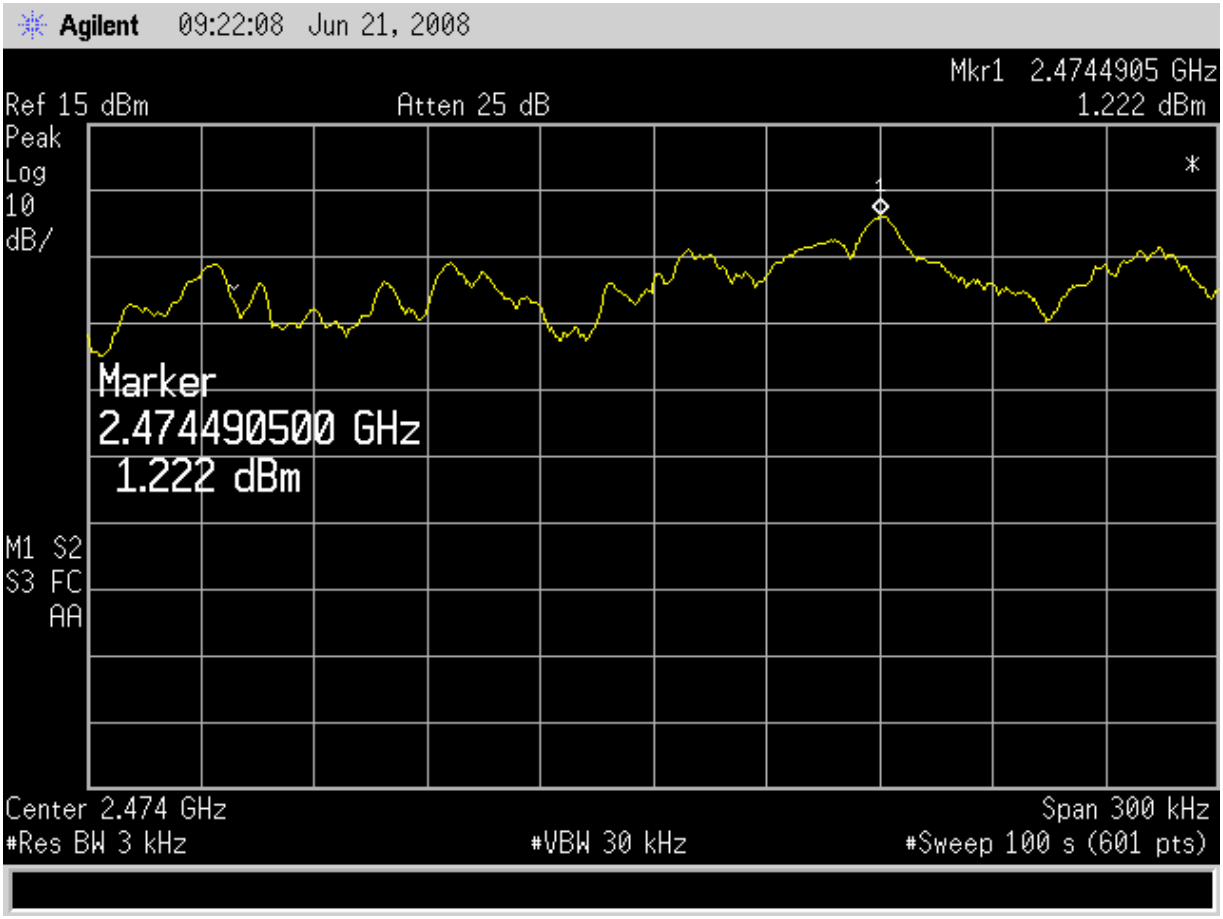
Ch11 2405 MHz



Ch18 2440 MHz



Ch25 2475 MHz



10 DEVIATION TO TEST SPECIFICATIONS

None.

11 DEBUG DESCRIPTION

None.