FCC 47 CFR PART 15 SUBPART C AND ANSI C63.4: 2003

TEST REPORT

For

ZigBee Ring

Model Number: Zg-T01R

Issued for

GlobalTop Technology Inc.

16 Nan-Ke 9th Rd., Science-based Industrial Park, Tainan 741, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
Tainan Lab.
No. 8, Jiu Cheng Ling, Jiaokeng Village,Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.
TEL: 886-6-580-2201
FAX: 886-6-580-2202

NVLAP LAB CODE 200627-0

Testing Laboratory 1109

Total Page: 48

REVISION HISTORY

Rev.		Issue Date		Revisions	Effect Page	Revised By
00		May 30, 2008		Initial Issue	ALL	Leah Peng

TABLE OF CONTENTS

1. TEST REPORT CERTIFICATION

Applicant ：GlobalTop Technology Inc.

Address ：16 Nan-Ke 9th Rd., Science-based Industrial Park, Tainan 741, Taiwan, R.O.C.

Manufacture ：GlobalTop Technology Inc.

Address ：16 Nan-Ke 9th Rd., Science-based Industrial Park, Tainan 741, Taiwan, R.O.C.

Equipment Under Test ：ZigBee Ring

Model Number ：Zg-T01R

Date of Test ：May 19, 2008 ~ May 21, 2008

APPLICABLE STANDARD	
STANDARD	**TEST RESULT**
FCC Part 15 Subpart C : 2004 AND ANSI C63.4 : 2003	No non-compliance noted

Approved by:

Jeter Wu
Section Manager
Compliance Certification Services Inc.

Reviewed by:

Eric Yang
Senior Engineer
Compliance Certification Services Inc.

2. EUT DESCRIPTION

2.1 DESCRIPTION OF EUT & POWER

Product Name	ZigBee Ring
Model Number	Zg-T01R
Frequency Range	2405MHz～2480MHz
Transmit Power (ERP)	CH Low:-4.06 dBm (0.393 mW)
Channel Spacing	5MHz
Channel Number	16 Channels
Type of Modulation	IEEE 802.15.4：DSSS
Frequency Selection	by software / firmware
Antenna Designation	Multilayer Ceramic Antenna Manufacture: Walsin Technology Corporation; Connector: Soldered on PCB board; Gain: 2.08dBi
Power Source	Powered from batteries 1.5VDC*2pcs.
Temperature Range	0 ~ +55°C

REMARK : 1. The sample selected for test was engineering sample that approximated to production product and was provided by manufacturer.
2. This submittal(s) (test report) is intended for FCC ID: **U95ZGT01R** filing to comply with Section 15.207,15.209 and 15.247 of the FCC Part 15, Subpart C Rules.

3. DESCRIPTION OF TEST MODES

The EUT is an IEEE 802.15.4 ZigBee transceiver.

The antenna peak gain 2.08dBi (highest gain) were chosen for full testing.

IEEE 802.15.4

The EUT had been tested under operating condition.

There are three channels have been tested as following :

Channel	Frequency (MHz)
Low	2405
Middle	2440
High	2480

4. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.4 and FCC CFR 47 2.1046, 2046, 2.1047, 2.1049, 2.1051, 2.1053, 2.1055, 2.1057, 15.207, 15.209 and 15.247.

5. FACILITIES AND ACCREDITATIONS

5.1 FACILITIES

All measurement facilities used to collect the measurement data are located at

No. 8, Jiu Cheng Ling, Jiaokeng Village,Sinhua Township, Tainan Hsien 712, Taiwan R.O.C.

The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

5.2 EQUIPMENT

Radiated emissions are measured with one or more of the following types of linearly polarized antennas: tuned dipole, biconical, log periodic, bi-log, and/or ridged waveguide, horn. Spectrum analyzers with preselectors and quasi-peak detectors are used to perform radiated measurements.

Conducted emissions are measured with Line Impedance Stabilization Networks and EMI Test Receivers.

Calibrated wideband preamplifiers, coaxial cables, and coaxial attenuators are also used for making measurements.

All receiving equipment conforms to CISPR Publication 16-1, “Radio Interference Measuring Apparatus and Measurement Methods.”

5.3 LABORATORY ACCREDITATIONS LISTINGS

The test facilities used to perform radiated and conducted emissions tests are accredited by National Voluntary Laboratory Accreditation Program for the specific scope of accreditation under Lab Code: 200627-0 to perform Electromagnetic Interference tests according to FCC PART 15 AND CISPR 22 requirements. No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government. In addition, the test facilities are listed with Federal Communications Commission (registration no: 455173 &TW-1037).

5.4 TABLE OF ACCREDITATIONS AND LISTINGS

Country	Agency	Scope of Accreditation	Logo
USA	NVLAP	EN 55014-1, AS/NZS 1044, CNS 13783-1, IEC/CISPR 14-1, IEC/CISPR 22, EN 55022, EN 61000-3-2, EN 61000-3-3, ANSI C63.4, AS/NZS CISPR 22, AS/NZS 3548, IEC 61000-4-2/3/4/5/6/8/11	NVLAP LAB CODE 200627-0 200627-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	455173 TW-1037
Japan	VCCI	3/10 meter Open Area Test Sites and conducted test sites to perform radiated/conducted measurements	C-2882 R-2635
Taiwan	TAF	CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, CNS 13803, CISPR 14, EN 55014, CNS 13783-1, CISPR 22, EN 55022, VCCI, FCC, Method-47 CFR Part 15 Subpart B, CNS 13438	ilac-MRA TAF Testing Laboratory 1109
Taiwan	BSMI	CNS 13438, CNS 13783-1, CNS 13803, CNS13439	SL2-IS-E-0039 SL2-IN-E-0039 SL2-R1/R2-0039 SL2-A1-E-0039
Canada	Industry Canada	RSS210, Issue 7	Canada IC 6192

* No part of this report may be used to claim or imply product endorsement by NVLAP or any agency of the US Government.

6. CALIBRATION AND UNCERTAINTY

6.1 MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

6.2 MEASUREMENT UNCERTAINTY

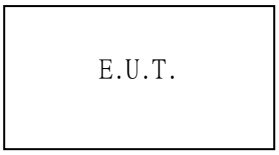
Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Radiated Emission, 30 to 1000 MHz	+/- 3.2 dB
Radiated Emission, 1 to 26.5 GHz	+/- 3.2 dB
Power Line Conducted Emission	+/- 2.1 dB

Uncertainty figures are valid to a confidence level of 95%

7. SETUP OF EQUIPMENT UNDER TEST

7.1 SETUP CONFIGURATION OF EUT



7.2 SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Certify No.	Signal cable
1	N/A	N/A	N/A	N/A	N/A

No.	Signal cable description	
A	N/A	N/A

REMARK:
1. All the above equipment/cables were placed in worse case positions to maximize emission signals during emission test.
2. Grounding was established in accordance with the manufacturer's requirements and conditions for the intended use.

7.3 EUT OPERATING CONDITION

RF Setup

1. Set up all equipments as diagram.
2. Check E.U.T. function.
3. The Test Program for Smart RF Studio software was used for testing
4. Set Con TX/RX 、channel、transmit power
5. Start to test

Normal Link Setup

1. Setup a whole system for test completely as shown on setup diagram.
2. Connect the batteries to E.U.T. and turn on power.
3. Check E.U.T. function.
4. Start to test.

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 6DB BANDWIDTH

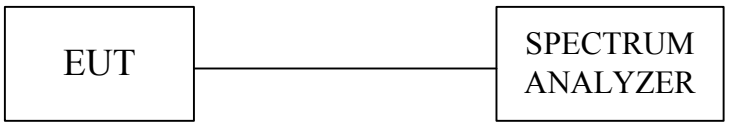
LIMIT

§ 15.207(a) (2) For direct sequence systems, the minimum 6dB bandwidth shall be at least 500kHz

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEM	829054/017	APR. 14, 2009

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to a spectrum analyzer. The bandwidth of the fundamental frequency was measured by spectrum analyzer with 100 KHz RBW and 300 KHz VBW. The 6dB bandwidth is defined as the total spectrum the power of which is higher than peak power minus 6dB.

TEST RESULTS

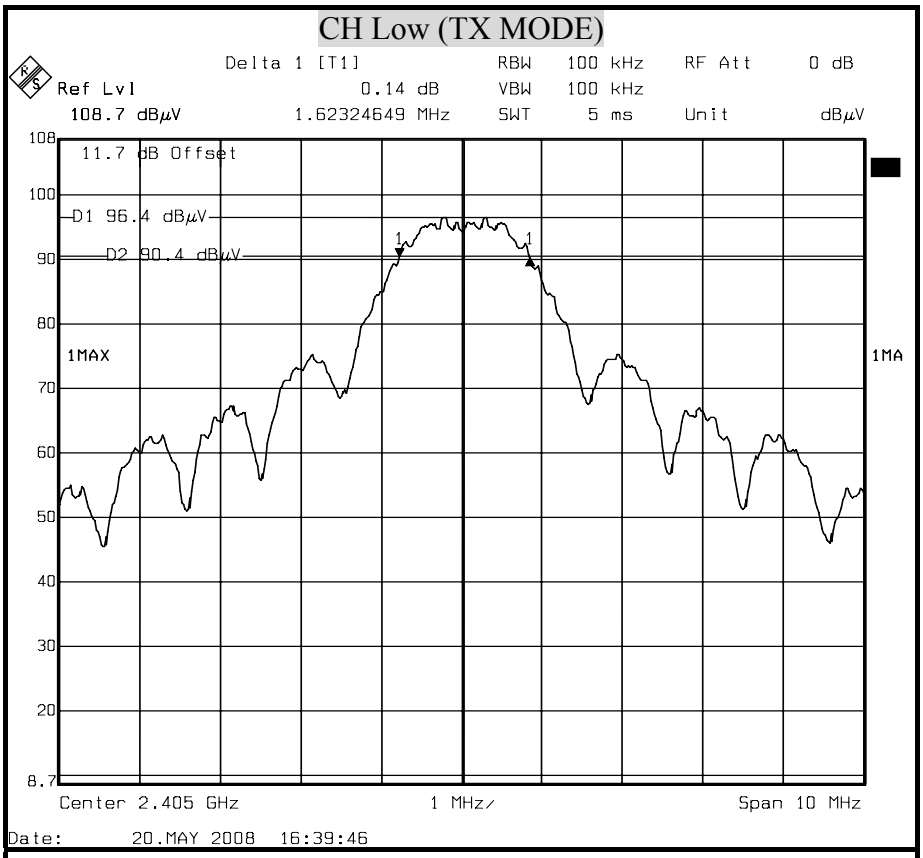
No non-compliance noted

TX mode

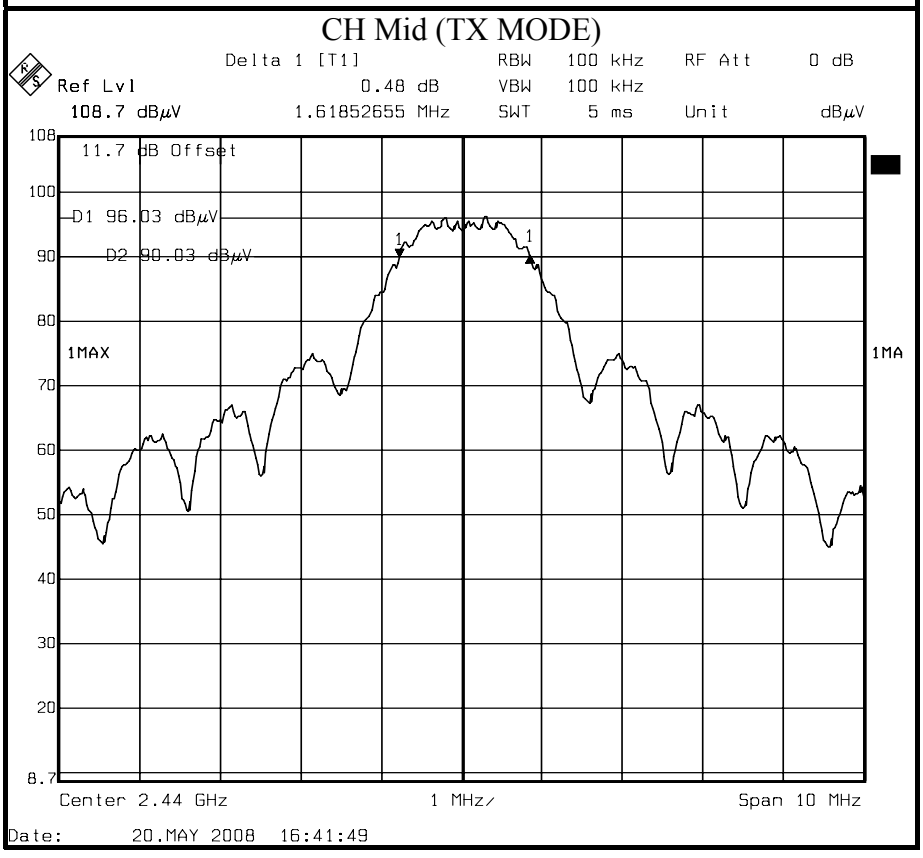
Channel	Channel Frequency (MHz)	6dB Bandwidth (kHz)	Minimum Limit (kHz)	Pass / Fail
Low	2405	1623	500	PASS
Middle	2440	1618	500	PASS
High	2480	1622	500	PASS

6dB BANDWIDTH (TX MODE)

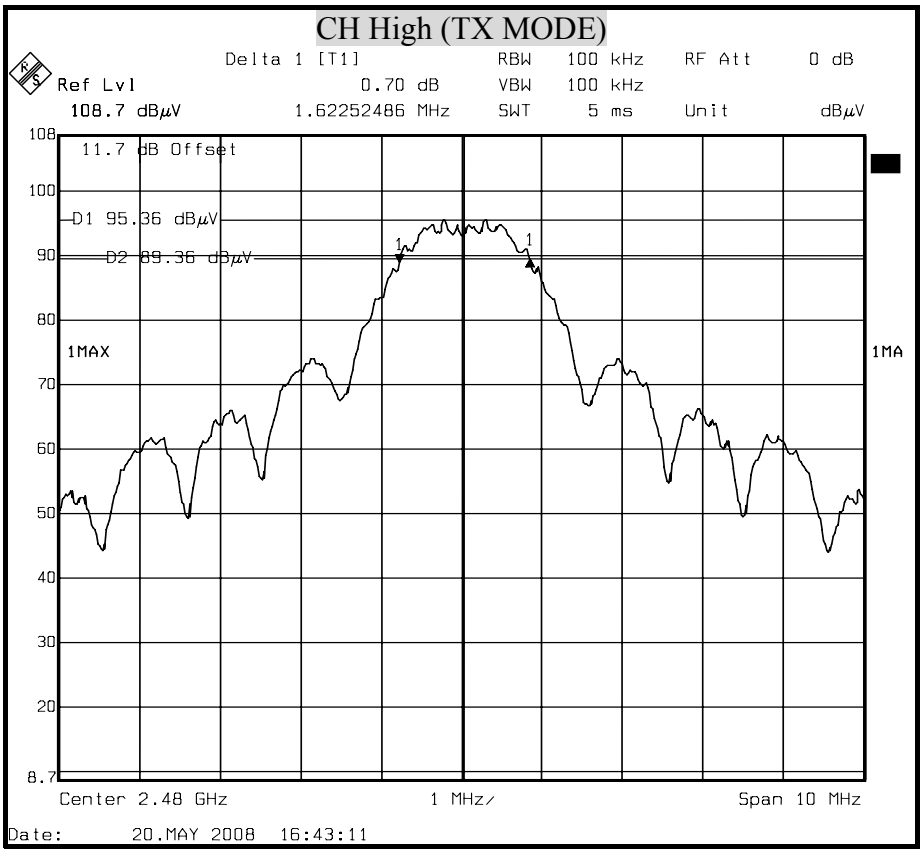
CH Low (TX MODE)



CH Mid (TX MODE)



CH High (TX MODE)



8.2 MAXIMUM PEAK OUTPUT POWER

LIMIT

§ 15.247(b) The maximum peak output power of the intentional radiator shall not exceed the following :

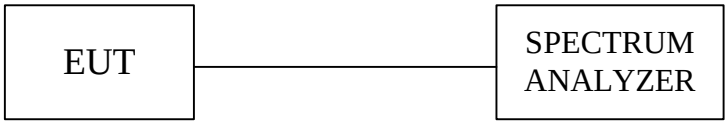
§ 15.247(b) (3) For systems using digital modulation in the 902-928 MHz, 2400-2483.5 MHz, and 5725-5850 MHz bands : 1 watt.

§ 15.247(b) (4) Except as shown in paragraphs (c) of this section , if transmitting antennas of directional gain greater than 6 dBi are used the peak output power from the intentional radiator shall be reduced below the stated values in paragraphs (b)(1) or (b)(2), and (b)(3) of this section , as appropriate, by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEM	829054/017	APR. 14, 2009

TEST SETUP



TEST PROCEDURE

Connect the EUT to spectrum analyzer, set the center frequency of the spectrum analyzer to the channel center frequency. Set the RBW to 1MHz and VBW to 3MHz. Using the Channel Power Function of the spectrum analyzer and set the measuring bandwidth to 6MHz. Record the measure channel power.

Measurement of Digital Transmission Systems Operating under Section 15.247

Power Output Option 2

Method #1

1 Set span to encompass the entire emission bandwidth (EBW) of the signal.
2 Set RBW = 1 MHz.
3 Set VBW ≥ 3 MHz.
4 Use sample detector mode if bin width (i.e., span/number of points in spectrum display) < 0.5 RBW. Otherwise use peak detector mode.
5 Use a video trigger with the trigger level set to enable triggering only on full power pulses. Transmitter must operate at full control power for entire sweep of every sweep. If the device transmits continuously, with no off intervals or reduced power intervals, the trigger may be set to ôhichfree runöhich.
6 Trace average 100 traces in power averaging mode.
7 Compute power by integrating the spectrum across the 26 dB EBW of the signal. The integration can be performed using the spectrum analyzer’ s band power measurement function with band limits set equal to the EBW band edges or by summing power levels in each 1 MHz band in linear power terms. The 1 MHz band power levels to be summed can be obtained by averaging, in linear power terms, power levels in each frequency bin across the 1 MHz.

TEST RESULTS

No non-compliance noted.
Total peak power calculation formula:

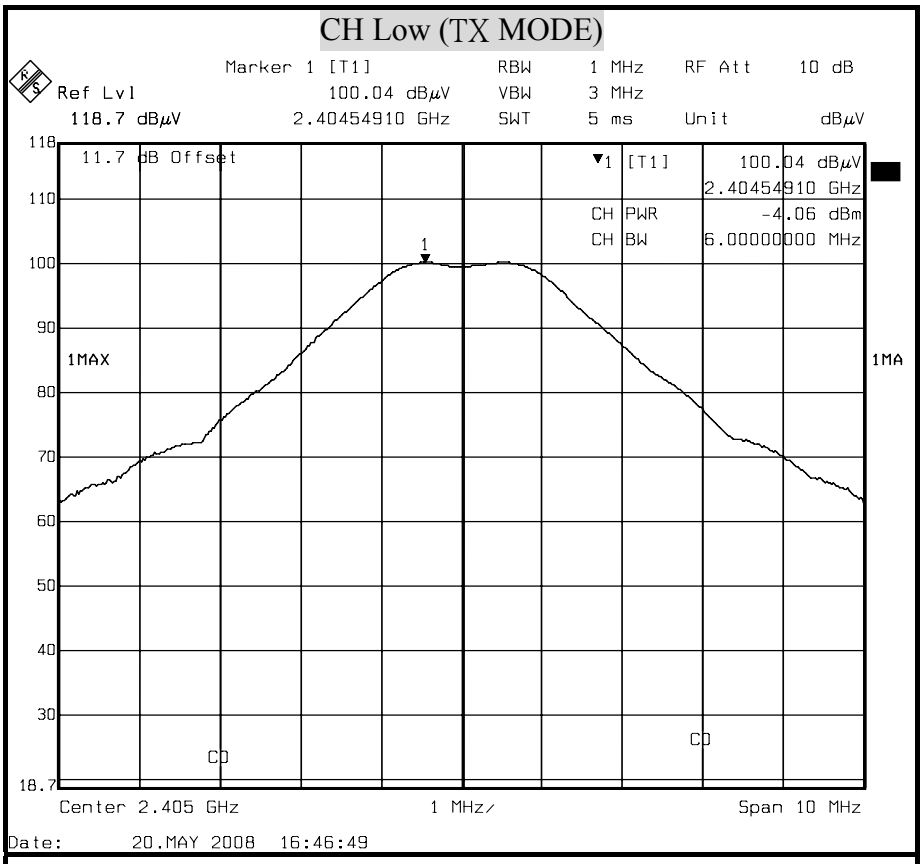
TX mode

Channel	Channel Frequency (MHz)	Peak Power (dBm)	Peak Power (W)	Peak Power Limit (W)	Pass / Fail
Low	2405	-4.06	0.00039	1	PASS
Middle	2440	-4.48	0.00036	1	PASS
High	2480	-5.22	0.00030	1	PASS

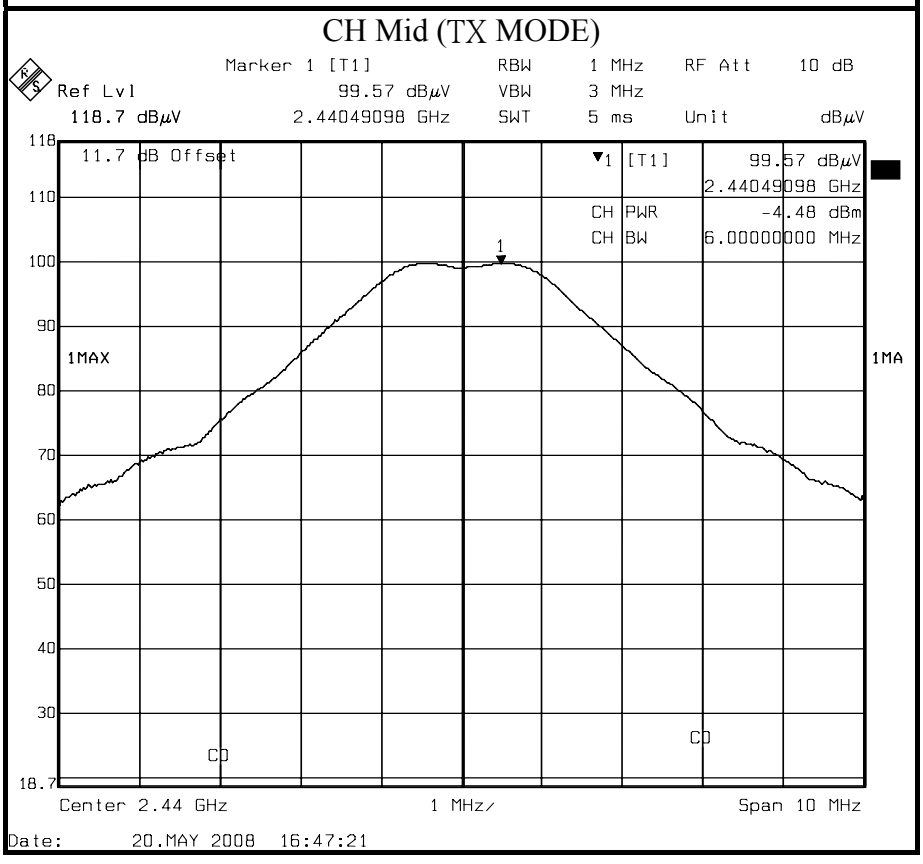
NOTE : The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

MAXIMUM PEAK OUTPUT POWER (TX MODE)

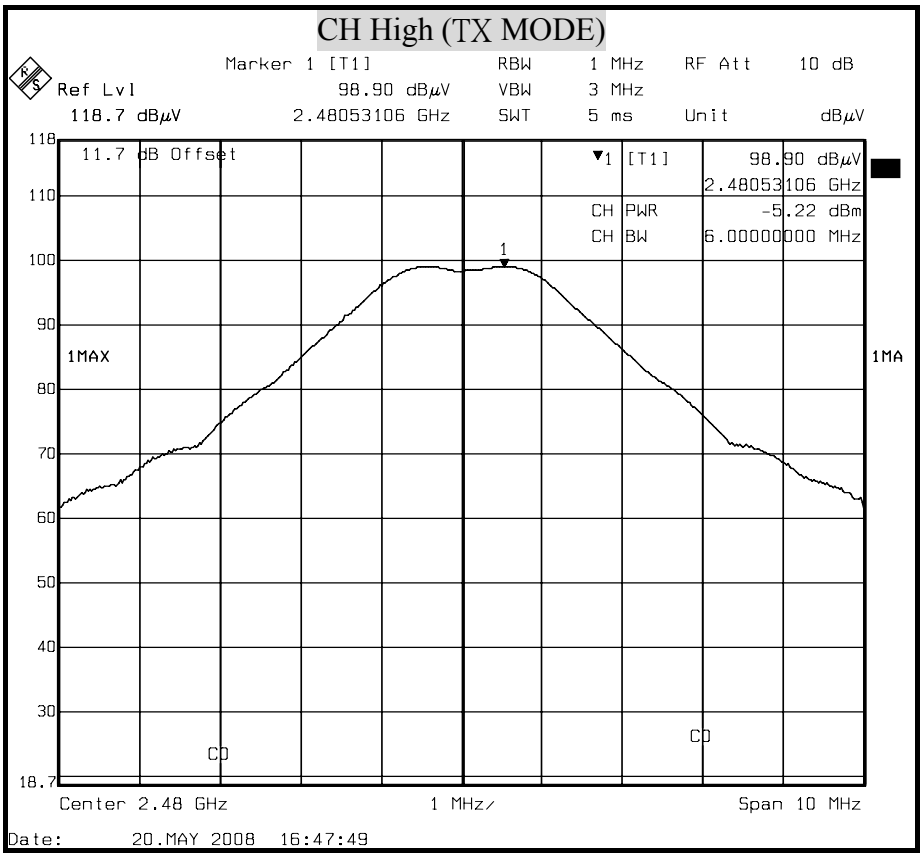
CH Low (TX MODE)



CH Mid (TX MODE)



CH High (TX MODE)



8.3 AVERAGE POWER

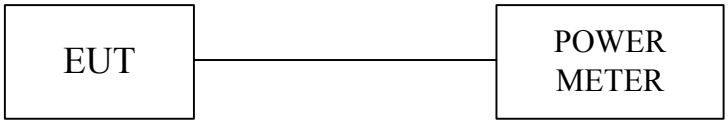
LIMIT

None; for reporting purposes only.

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Power Meter	Anritsu	ML2487A	6K00003888	APR. 15, 2009

TEST SETUP



TEST PROCEDURE

The transmitter output is connected to a power meter.

TEST RESULTS

Total Average power calculation formula:

No non-compliance noted

TX mode

Channel	Channel Frequency (MHz)	Average Power (dBm)
Low	2405	-5.56
Middle	2440	-6.22
High	2480	-6.93

8.4 POWER SPECTRAL DENSITY

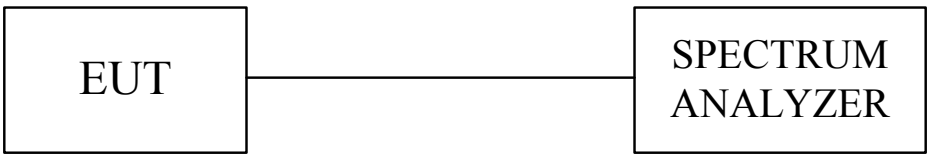
LIMIT

§ 15.247(e) For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.

TEST EQUIPMENTS

Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEM	829054/017	APR. 14, 2009

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using RBW=3KHz and VBW≧RBW, set sweep time=span / 3KHz.
The power spectral density was measured and recorded.
The sweep time is allowed to be longer than span / 3KHz for a full response of the mixer in the spectrum analyzer.

TEST RESULTS

Total peak power calculation formula:

No non-compliance noted

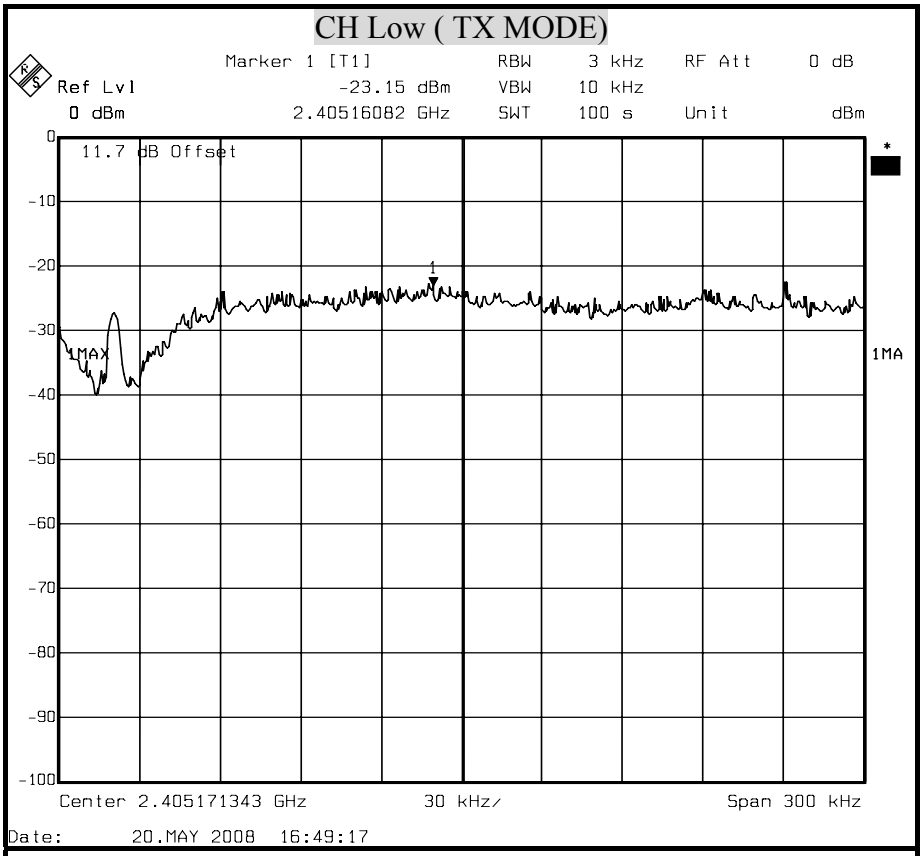
TX mode

Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maximum Limit (dBm)	Pass / Fail
Low	2405	-23.15	8	PASS
Middle	2440	-23.32	8	PASS
High	2480	-23.64	8	PASS

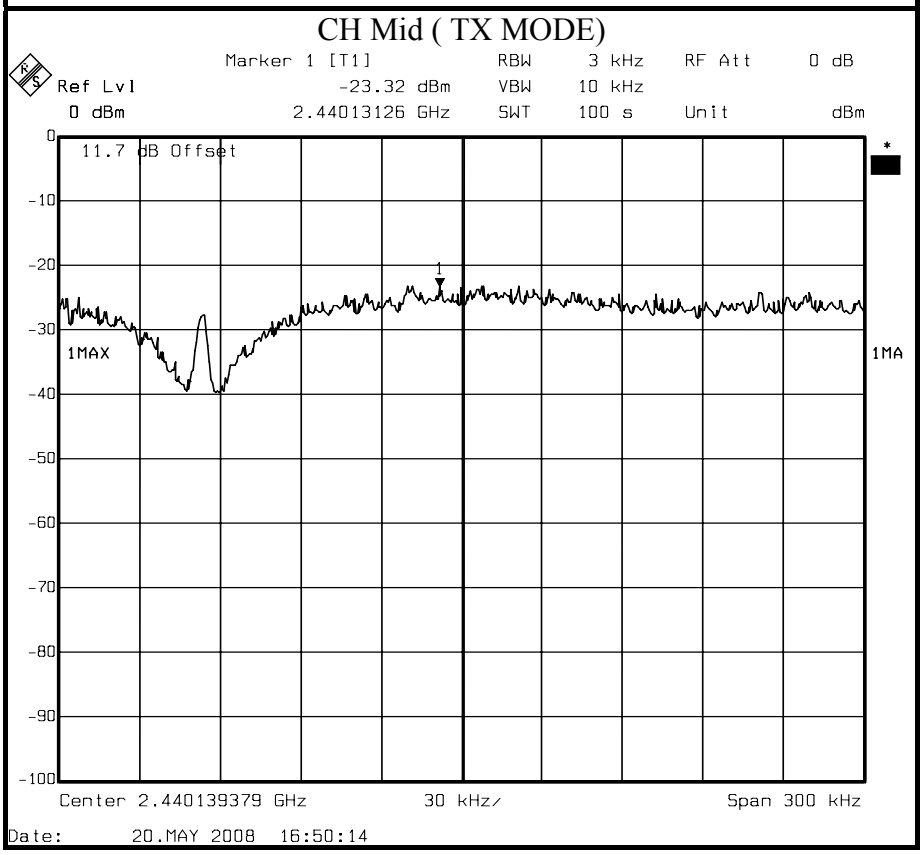
NOTE: 1. The cable assembly insertion loss of 11.7dB (including 10 dB pad and 1.7 dB cable) was Entered as an offset in the spectrum analyzer to allow for direct reading of power.

POWER SPECTRAL DENSITY (TX MODE)

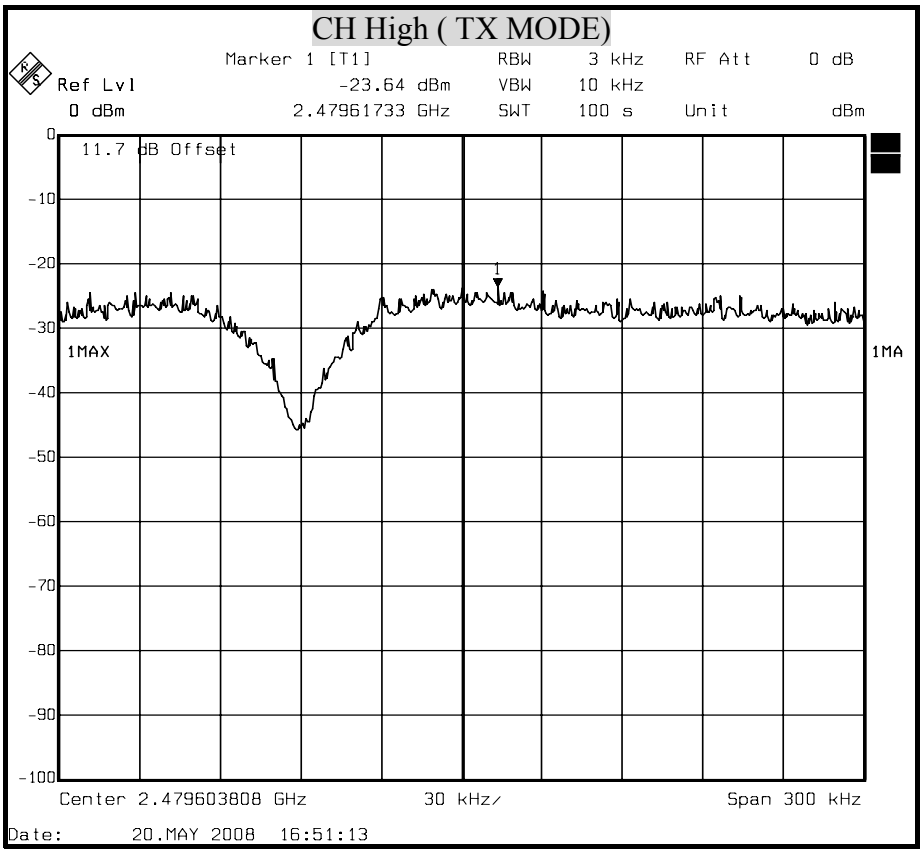
CH Low (TX MODE)



CH Mid (TX MODE)



CH High (TX MODE)



8.5 CONDUCTED SPURIOUS EMISSION

LIMITS

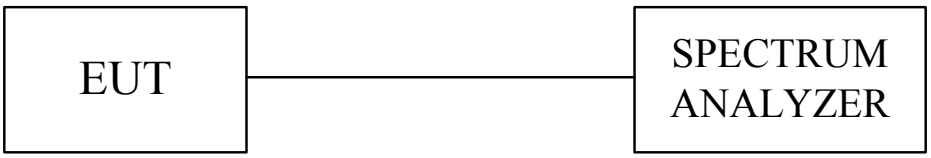
§ 15.247(d) In any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the and that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in § 15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in § 15.205(a), must also comply with the radiated emission limits specified in § 15.209(a) (see § 15.205(c)).

TEST PROCEDURE

The transmitter output is connected to a spectrum analyzer. The resolution bandwidth is set to 100 kHz. The video bandwidth is set to 300 kHz.

The spectrum from 30 MHz to 26 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

TEST SETUP



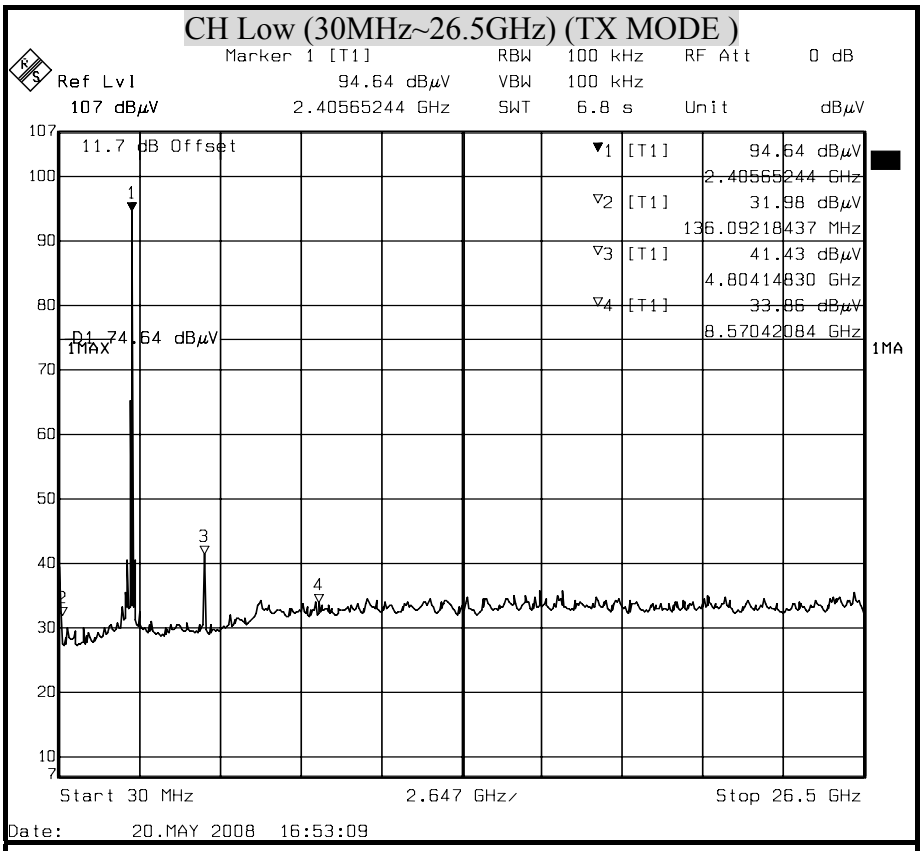
TEST RESULTS

No non-compliance noted.

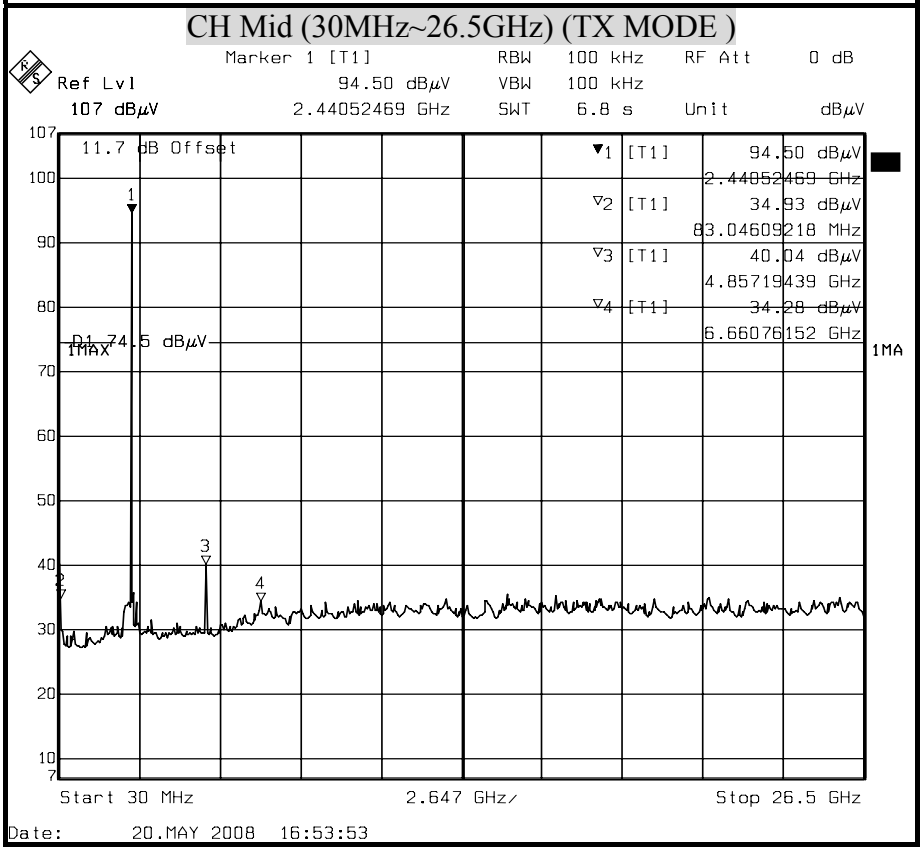
OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

(TX MODE)

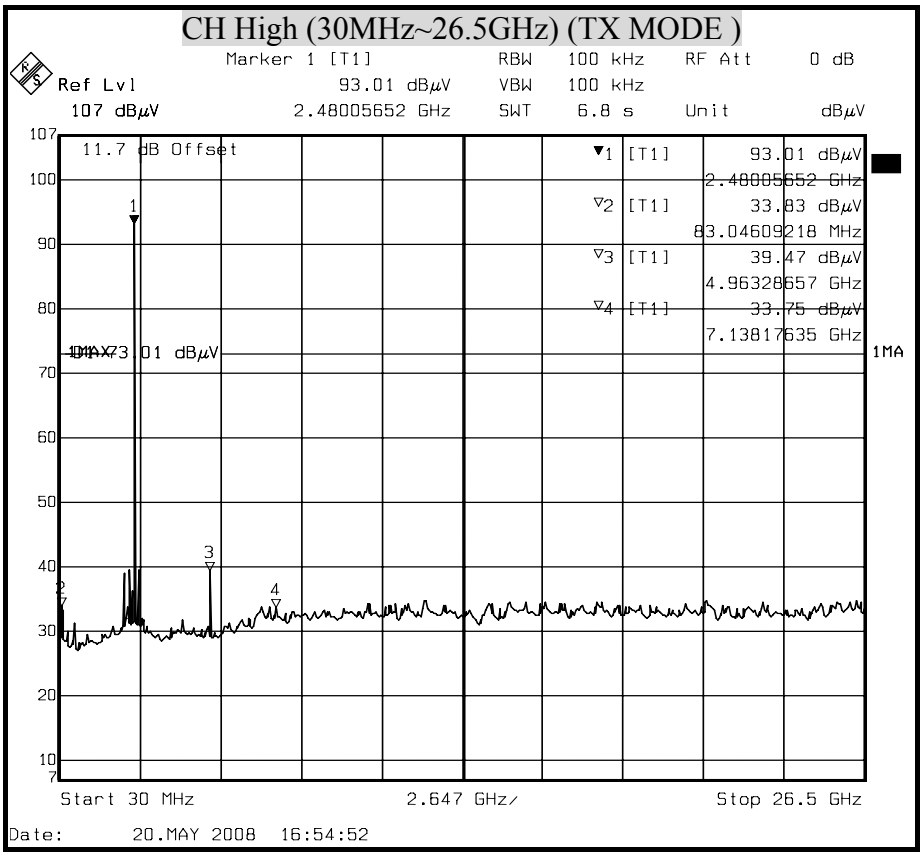
CH Low (30MHz~26.5GHz) (TX MODE)



CH Mid (30MHz~26.5GHz) (TX MODE)



CH High (30MHz~26.5GHz) (TX MODE)



8.6 RADIATED EMISSIONS

8.6.1 TRANSMITTER RADIATED SUPURIOUS EMSSIONS

LIMITS

§ 15.205 (a) Except as shown in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 - 0.110	16.42 - 16.423	399.9 - 410	4.5 - 5.15
[1]0.495 - 0.505	16.69475 - 16.69525	608 - 614	5.35 - 5.46
2.1735 - 2.1905	16.80425 - 16.80475	960 - 1240	7.25 - 7.75
4.125 - 4.128	25.5 - 25.67	1300 - 1427	8.025 - 8.5
4.17725 - 4.17775	37.5 - 38.25	1435 - 1626.5	9.0 - 9.2
4.20725 - 4.20775	73 - 74.6	1645.5 - 1646.5	9.3 - 9.5
6.215 - 6.218	74.8 - 75.2	1660 -1710	10.6 -12.7
6.26775 - 6.26825	108 -121.94	1718.8 - 1722.2	13.25 -13.4
6.31175 - 6.31225	123 - 138	2200 - 2300	14.47 – 14.5
8.291 - 8.294	149.9 - 150.05	2310 - 2390	15.35 -16.2
8.362 - 8.366	156.52475 - 156.52525	2483.5 - 2500	17.7 - 21.4
8.37625 - 8.38675	156.7 - 156.9	2655 - 2900	22.01 - 23.12
8.41425 - 8.41475	162.0125 - 167.17	3260 - 3267	23.6 - 24.0
12.29 - 12.293	167.72 - 173.2	3332 - 3339	31.2 - 31.8
12.51975 - 12.52025	240 - 285	3345.8 - 3338	36.43 - 36.5
12.57675 - 12.57725	322 -335.4	3600 - 4400	([2])
13.36 - 13.41			

[1] Until February 1, 1999, this restricted band shall be 0.490-0.510 MHz.

[2] Above 38.6

§ 15.205 (b) Except as provided in paragraphs (d) and (e), the field strength of emissions appearing within these frequency bands shall not exceed the limits shown is Section 15.209. At frequencies equal to or less than 1000 MHz, compliance with the limits in Section 15.209 shall be demonstrated using measurement instrumentation employing a CISPR quasi-peak detector. Above 1000 MHz, compliance with the emission limits in Section 15.209 shall be demonstrated based on the average value of the measured emissions. The provisions in Section 15.35 apply to these measurements.

§ 15.209 (a) Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table :

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 - 88	100 **	3
88 - 216	150 **	3
216 - 960	200 **	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz, However, operation within these frequency bands is permitted under other sections of this Part, e-g, Sections 15.231 and 15.241.

§ 15.209 (b) In the emission table above, the tighter limit applies at the band edges.

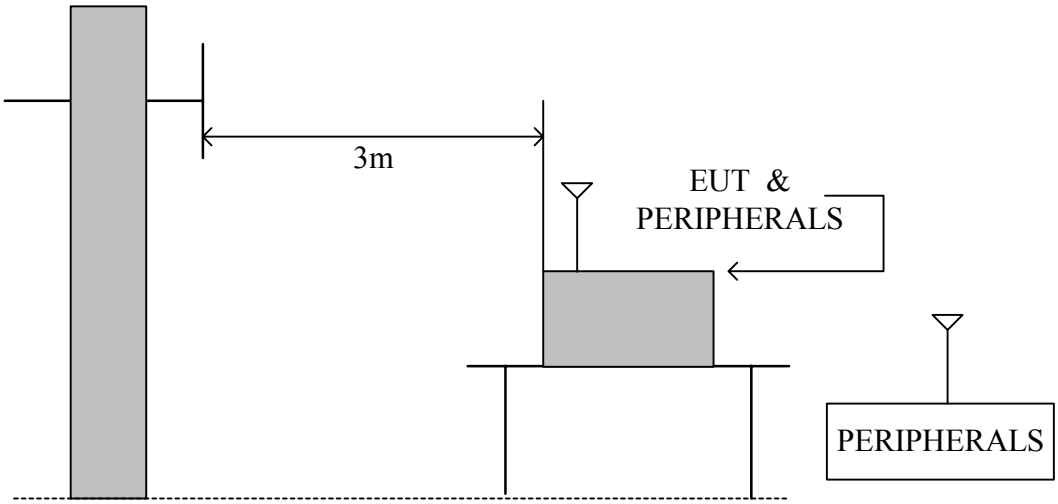
TEST EQUIPMENTS

The following test equipments are utilized in making the measurements contained in this report.

Open Area Test Site # 6				
Name of Equipment	Manufacturer	Model	Serial Number	Calibration Due
Spectrum Analyzer	R&S	FSEM	829054/017	APR. 14, 2009
Temp./Humidity Chamber	K.SON	THS-M1	242	JUN. 11, 2008
EMI Test Receiver	R&S	ESVS10	833206/012	APR. 15, 2009
Pre-Amplifier	HP	8447F	2944A03817	NOV. 01, 2008
Amplifier	MITEQ	AFSYY-00108650-42-10P-44	1205908	NOV. 05, 2008
Bilog Antenna	Sunol	JB1	A013105-1	NOV. 24, 2008
Horn Antenna	Com-Power	AH-118	071032	DEC. 20, 2008
Turn Table	YO Chen	001	N/A	N.C.R
Antenna Tower	AR	TP100A	N/A	N.C.R
Controller	CT	SC101	N/A	N.C.R
RF Swicth	E-INSTRUMENT TELH LTD	ERS-180-1-2	EC1204141	N.C.R
Site NSA	CCS	N/A	N/A	NOV. 22, 2008
Power Meter	Anritsu	ML2487A	6K00003888	APR. 15, 2009
Power Sensor	Anritsu	MA2491A	33265	MAR. 13, 2009
AC Power Source	T-POWER	TFC-3020	N930010	N.C.R
DC Power Source	LOKO	DSP-5050	L1507009282	N.C.R
Substituted Dipole	SCHWAZBECK	VHAP/UHAP	998+999/981+982	JUN. 22, 2008

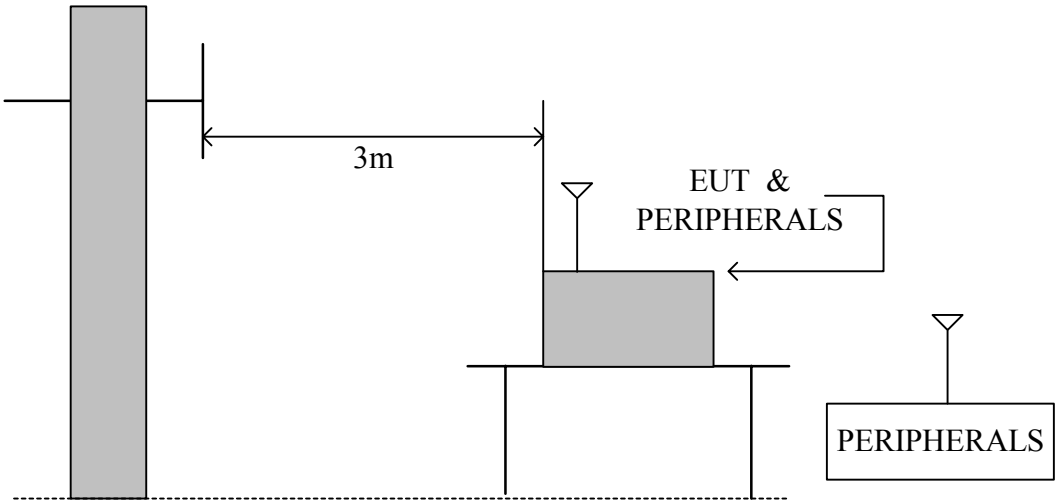
TEST SETUP

The diagram below shows the test setup that is utilized to make the measurements for emission from 30 to 1GHz.



Antenna Elevation Variable

The diagram below shows the test setup that is utilized to make the measurements for emission above 1GHz.



Antenna Elevation Variable

TEST PROCEDURE

a. The EUT was placed on the top of a rotating table 0.8 meters above the ground at a 10 meter open area test site. The table was rotated 360 degrees to determine the position of the highest radiation.

b. White measuring the radiated emission below 1GHz, the EUT was set 3 meters away from the interference-receiving antenna, which was mounted on the top of a variable-height antenna tower. White measuring the radiated emission above 1GHz, the EUT was set 3 meters away from the interference-receiving antenna

c. The antenna is a broadband antenna, and its 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 polarization 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 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 10 dB 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 10 dB margin would be re-tested one by one using peak, quasi-peak or average method as specified and then reported in a data sheet.

NOTE：

1. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 120 KHz for Peak detection (PK) and Quasi-peak detection (QP) at frequency below 1GHz.

2. The resolution bandwidth and video bandwidth of test receiver/spectrum analyzer is 1 MHz for Peak detection and frequency above 1GHz.

3. The resolution bandwidth of test receiver/spectrum analyzer is 1 MHz and the video bandwidth is 10 Hz for Average detection (AV) at frequency above 1GHz.

4. **No emission is found between lowest internal used/generated frequency to 30MHz (9kHz~30MHz)**

TEST RESULTS

No non-compliance noted

8.6.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz

Product Name	ZigBee Ring	Test Date	2008/5/21
Model	Zg-T01R	Test By	Eric Yang
Test Mode	Normal operating (worst case)	TEMP& Humidity	28.7℃, 54%

Horizontal

Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Level	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dBμV/M)	(dB)	PK/QP
63.82	16.52	7.93	1.01	25.46	40.00	-14.54	QP
183.24	15.26	11.82	1.75	28.83	43.50	-14.67	QP
261.82	18.74	12.63	2.13	33.49	46.00	-12.51	QP
438.35	14.81	16.89	3.46	35.16	46.00	-10.84	QP
565.48	10.74	18.85	3.38	32.98	46.00	-13.02	QP
798.22	8.70	21.78	4.13	34.61	46.00	-11.39	QP
918.00	8.02	22.88	4.53	35.43	46.00	-10.57	QP
N/A	-----	-----	-----	-----	-----	-----	-----

Vertical

Frequency	Meter Reading	Antenna Factor	Cable Loss	Emission Level	Limits	Margin	Detector Mode
(MHz)	(dBμV)	(dB/M)	(dB)	(dBμV/M)	(dBμV/M)	(dB)	PK/QP
53.44	17.16	8.09	0.97	26.22	40.00	-13.78	QP
181.35	15.62	11.64	1.74	29.00	43.50	-14.50	QP
261.85	15.74	12.63	2.13	30.49	46.00	-15.51	QP
458.72	14.11	17.26	3.32	34.69	46.00	-11.31	QP
566.45	13.62	18.86	3.39	35.87	46.00	-10.13	QP
798.22	7.80	21.78	4.13	33.71	46.00	-12.29	QP
918.03	7.60	22.88	4.53	35.01	46.00	-10.99	QP
N/A	-----	-----	-----	-----	-----	-----	-----

REMARK: Emission level (dBμV/m) =Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).

8.6.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	ZigBee Ring	Test Date	2008/5/19
Model	Zg-T01R	Test By	Eric Yang
Test Mode	TX (CH Low)	TEMP& Humidity	30.6℃, 49%

Horizontal

	TX / IEEE 802.11b mode / CH Low				Measurement Distance at 3m Horizontal polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	2405.52	95.31	30.06	2.34	39.80	0.00	87.91	Fundamental Frequency		P
	2405.52	92.93	30.06	2.34	39.80	0.00	85.53			A
*	1381.85	54.69	26.10	1.95	39.69	0.77	43.81	74.00	-30.19	P
*	1381.85	52.34	26.10	1.95	39.69	0.77	41.46	54.00	-12.54	A
*	4809.47	49.11	32.78	3.70	41.31	0.69	44.96	74.00	-29.04	P
*	4809.47	40.32	32.78	3.70	41.31	0.69	36.17	54.00	-17.83	A
	7215.23	48.62	38.80	4.92	41.45	1.39	52.28	67.91	-15.63	P
	7215.23	39.37	38.80	4.92	41.45	1.39	43.03	65.53	-22.50	A
	N/A	------	------	------	------	------	------	------	------	P
	N/A	------	------	------	------	------	------	------	------	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:
   Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	ZigBee Ring	Test Date	2008/5/19
Model	Zg-T01R	Test By	Eric Yang
Test Mode	TX (CH Low)	TEMP& Humidity	30.6℃, 49%

Vertical

	TX / IEEE 802.11b mode / CH Low				Measurement Distance at 3m Vertical polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	2404.55	89.68	30.06	2.34	39.80	0.00	82.28	Fundamental Frequency		P
	2404.55	87.27	30.06	2.34	39.80	0.00	79.87			A
*	1381.86	53.97	26.10	1.95	39.69	0.77	43.09	74.00	-30.91	P
*	1381.86	51.42	26.10	1.95	39.69	0.77	40.54	54.00	-13.46	A
*	4809.59	48.67	32.78	3.70	41.31	0.69	44.52	74.00	-29.48	P
*	4809.59	39.25	32.78	3.70	41.31	0.69	35.10	54.00	-18.90	A
	7215.41	49.25	38.80	4.92	41.45	1.39	52.91	62.28	-9.37	P
	7215.41	39.11	38.80	4.92	41.45	1.39	42.77	59.87	-17.10	A
	N/A	------	------	------	------	------	------	------	------	P
	N/A	------	------	------	------	------	------	------	------	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit

4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	ZigBee Ring	Test Date	2008/5/19
Model	Zg-T01R	Test By	Eric Yang
Test Mode	TX (CH Middle)	TEMP& Humidity	30.6℃, 49%

Horizontal

	TX / IEEE 802.11b mode / CH Middle				Measurement Distance at 3m Horizontal polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	2440.02	96.66	30.04	2.34	39.77	0.00	89.27	Fundamental Frequency		P
	2440.02	94.16	30.04	2.34	39.77	0.00	86.77			A
*	1382.02	54.36	26.10	1.95	39.69	0.77	43.48	74.00	-30.52	P
*	1382.02	51.28	26.10	1.95	39.69	0.77	40.40	54.00	-13.60	A
*	4880.06	49.35	32.94	3.74	41.42	0.71	45.32	74.00	-28.68	P
*	4880.06	40.81	32.94	3.74	41.42	0.71	36.78	54.00	-17.22	A
*	7320.12	48.36	38.95	4.96	41.31	1.62	52.58	74.00	-21.42	P
*	7320.12	39.25	38.95	4.96	41.31	1.62	43.47	54.00	-10.53	A
	N/A	------	------	------	------	------	------	------	------	P
	N/A	------	------	------	------	------	------	------	------	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	ZigBee Ring	Test Date	2008/5/19
Model	Zg-T01R	Test By	Eric Yang
Test Mode	TX (CH Middle)	TEMP& Humidity	30.6℃, 49%

Vertical

	TX / IEEE 802.11b mode / CH Middle				Measurement Distance at 3m Vertical polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	2440.04	91.60	30.04	2.34	39.77	0.00	84.21	Fundamental Frequency		P
	2440.04	89.06	30.04	2.34	39.77	0.00	81.67			A
*	1380.03	53.64	26.09	1.94	39.69	0.77	42.75	74.00	-31.25	P
*	1380.03	51.02	26.09	1.94	39.69	0.77	40.13	54.00	-13.87	A
*	4880.02	48.65	32.94	3.74	41.42	0.71	44.62	74.00	-29.38	P
*	4880.02	39.82	32.94	3.74	41.42	0.71	35.79	54.00	-18.21	A
*	7320.05	47.69	38.95	4.96	41.31	1.61	51.91	74.00	-22.09	P
*	7320.05	38.51	38.95	4.96	41.31	1.61	42.73	54.00	-11.27	A
	N/A	------	------	------	------	------	------	------	------	P
	N/A	------	------	------	------	------	------	------	------	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit

4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	ZigBee Ring	Test Date	2008/5/19
Model	Zg-T01R	Test By	Eric Yang
Test Mode	TX (CH High)	TEMP& Humidity	30.6℃, 49%

Horizontal

	TX / IEEE 802.11b mode / CH High				Measurement Distance at 3m Horizontal polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	2479.99	98.41	30.01	2.34	39.74	0.00	91.03	Fundamental Frequency		P
	2479.99	95.84	30.01	2.34	39.74	0.00	88.46			A
*	1379.95	53.64	26.09	1.94	39.69	0.77	42.75	74.00	-31.25	P
*	1379.95	51.28	26.09	1.94	39.69	0.77	40.39	54.00	-13.61	A
*	4960.05	49.82	33.11	3.78	41.54	0.74	45.92	74.00	-28.08	P
*	4960.05	40.17	33.11	3.78	41.54	0.74	36.27	54.00	-17.73	A
*	7440.12	49.32	39.12	5.01	41.14	1.87	54.19	74.00	-19.81	P
*	7440.12	39.58	39.12	5.01	41.14	1.87	44.45	54.00	-9.55	A
	N/A	------	------	------	------	------	------	------	------	P
	N/A	------	------	------	------	------	------	------	------	A

REMARK:

1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit

4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

Product Name	ZigBee Ring	Test Date	2008/5/19
Model	Zg-T01R	Test By	Eric Yang
Test Mode	TX (CH High)	TEMP& Humidity	30.6℃, 49%

Vertical

	TX / IEEE 802.11b mode / CH High				Measurement Distance at 3m Vertical polarity					
	Freq.	Reading	AF	Cable Loss	Pre-amp	Filter	Level	Limit	Margin	Mark
	(MHz)	(dBμV)	(dB/m)	(dB)	(dB)	(dB)	(dBμV/m)	(dBμV/m)	(dB)	(P/Q/A)
	2479.57	95.91	30.01	2.34	39.74	0.00	88.53	Fundamental Frequency		P
	2479.57	93.42	30.01	2.34	39.74	0.00	86.04			A
*	1380.05	52.68	26.09	1.94	39.69	0.77	41.79	74.00	-32.21	P
*	1380.05	51.36	26.09	1.94	39.69	0.77	40.47	54.00	-13.53	A
*	4959.93	48.65	33.11	3.78	41.54	0.74	44.75	74.00	-29.25	P
*	4959.93	39.25	33.11	3.78	41.54	0.74	35.35	54.00	-18.65	A
*	7440.82	48.62	39.12	5.02	41.13	1.87	53.49	74.00	-20.51	P
*	7440.82	38.59	39.12	5.02	41.13	1.87	43.46	54.00	-10.54	A
	N/A	------	------	------	------	------	------	------	------	P
	N/A	------	------	------	------	------	------	------	------	A

REMARK:

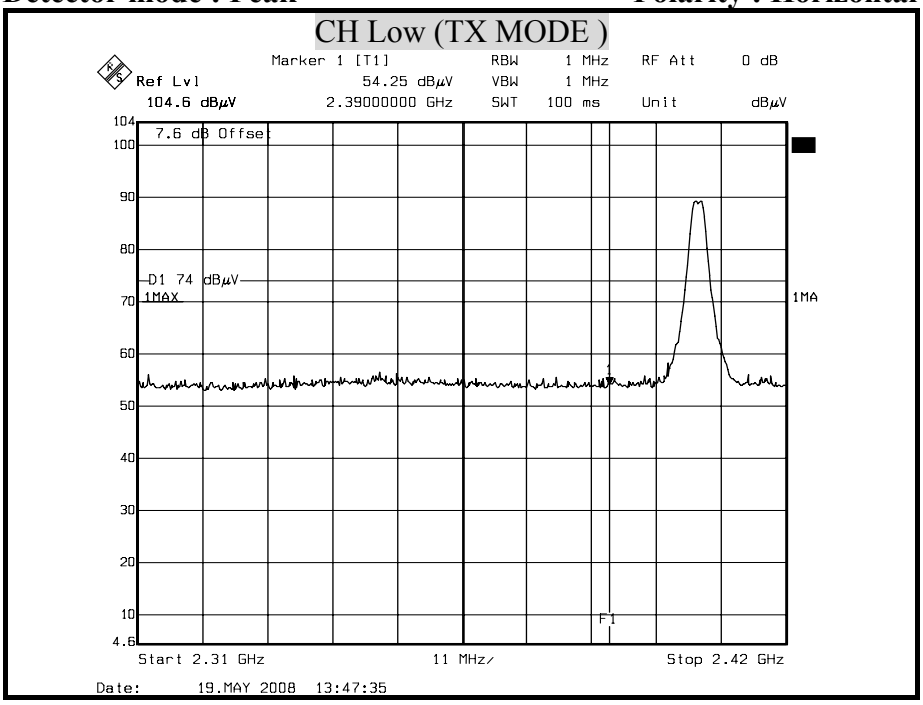
1. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
2. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
3. The result basic equation calculation is as follow:

Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit

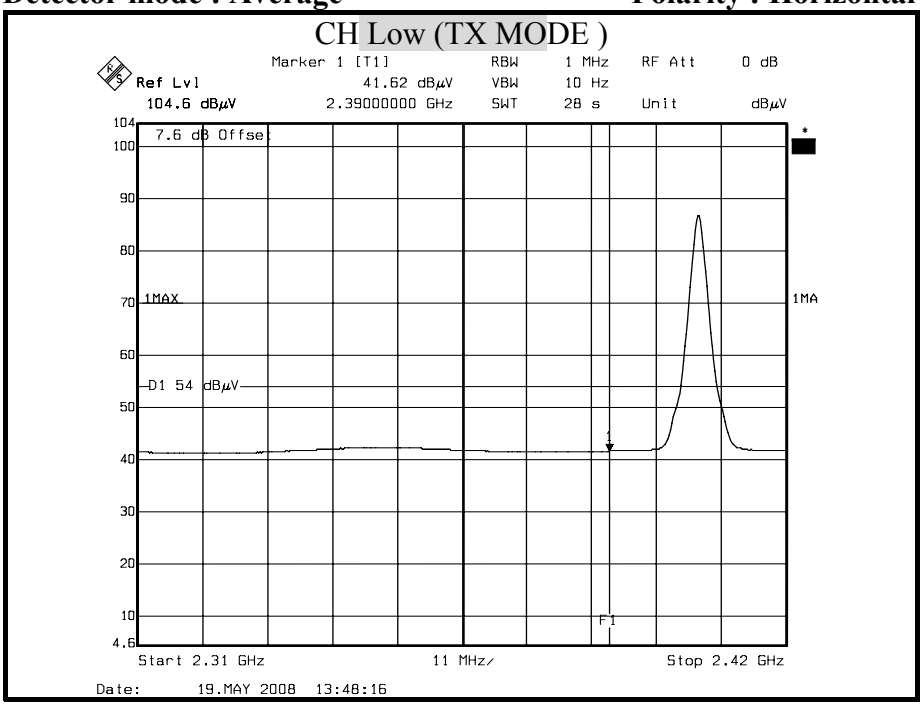
4. The other emission levels were 20dB below the limit
5. The test limit distance is 3M limit.

8.6.4 RESTRICTED BAND EDGES

Detector mode : Peak **Polarity : Horizontal**



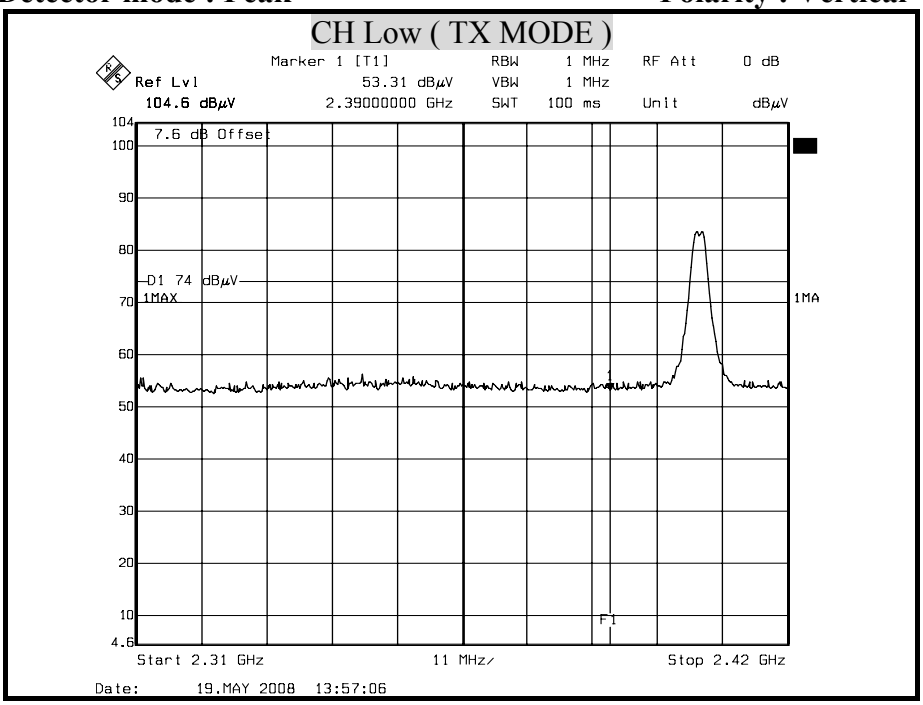
Detector mode : Average **Polarity : Horizontal**



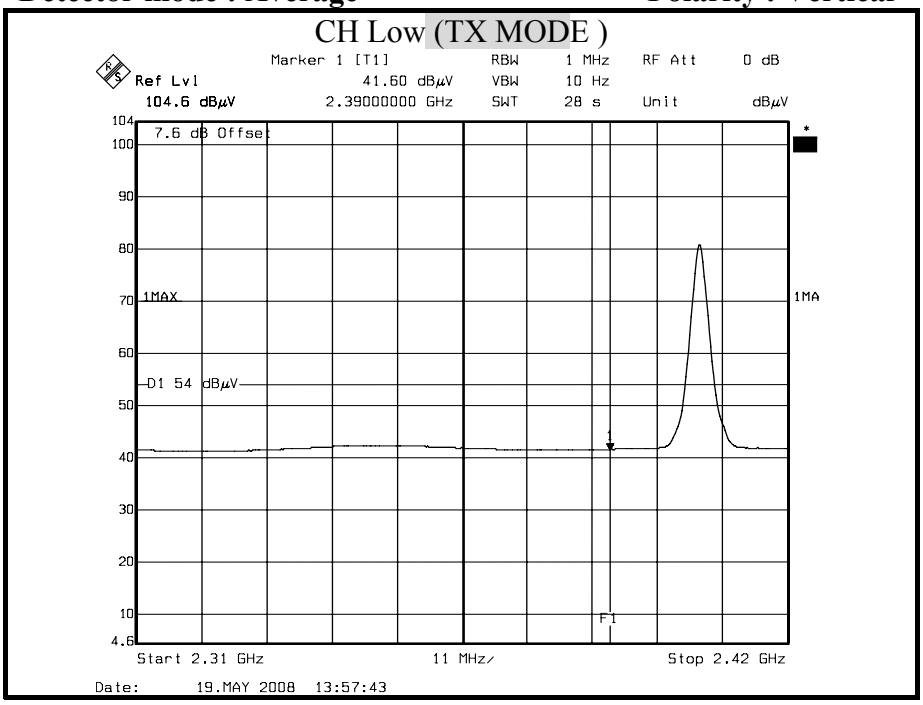
Remark:

1. Display Line = 54/74 dB μ V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.6(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.62(dB)

Detector mode : Peak **Polarity : Vertical**



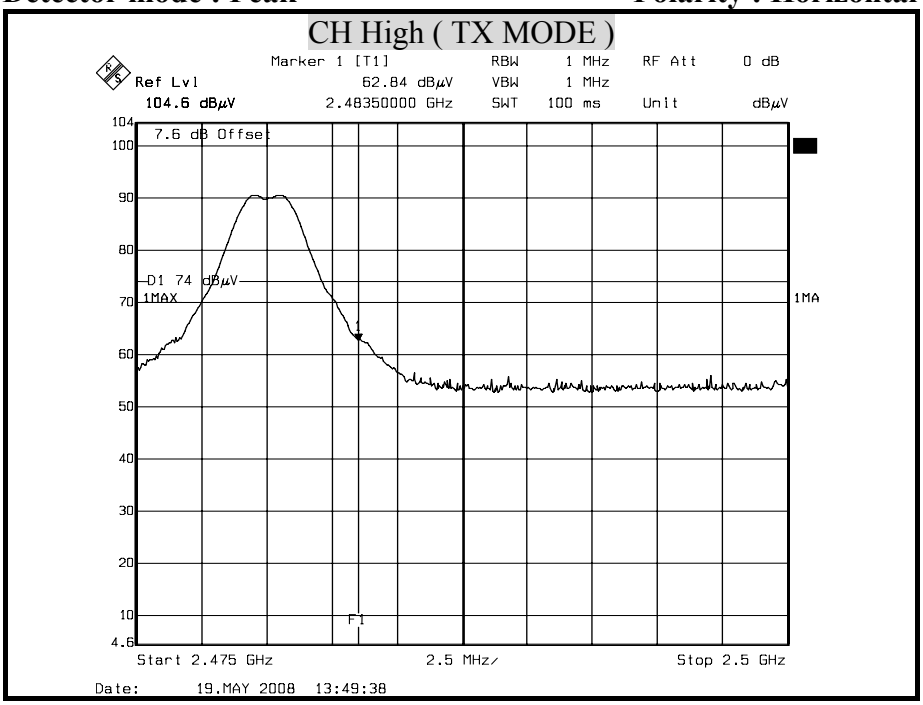
Detector mode : Average **Polarity : Vertical**



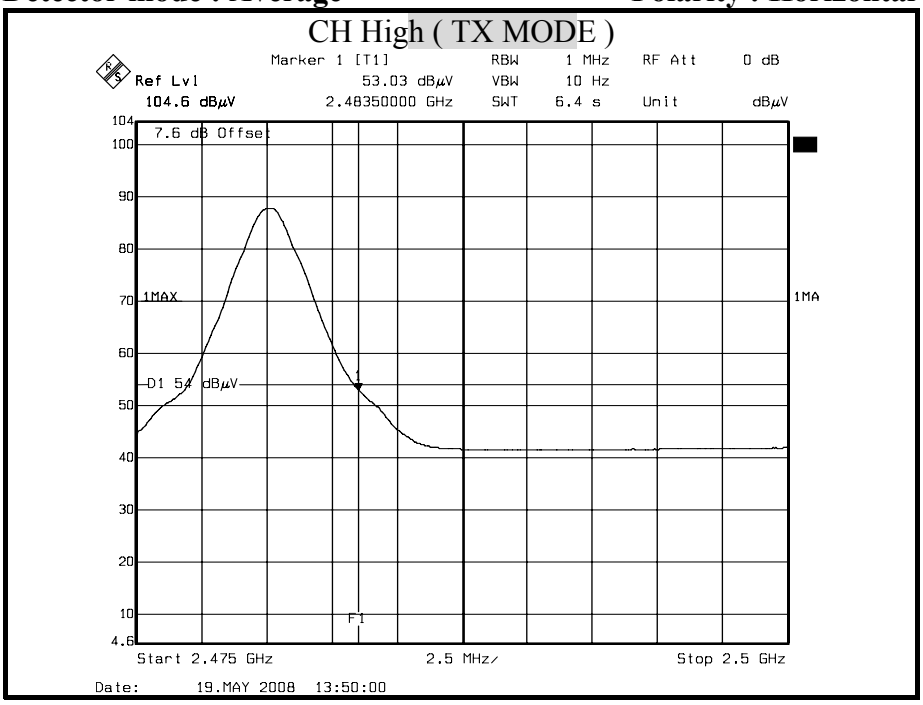
Remark:

1. Display Line = 54/74 dB μ V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.6(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.62(dB)

Detector mode : Peak **Polarity : Horizontal**



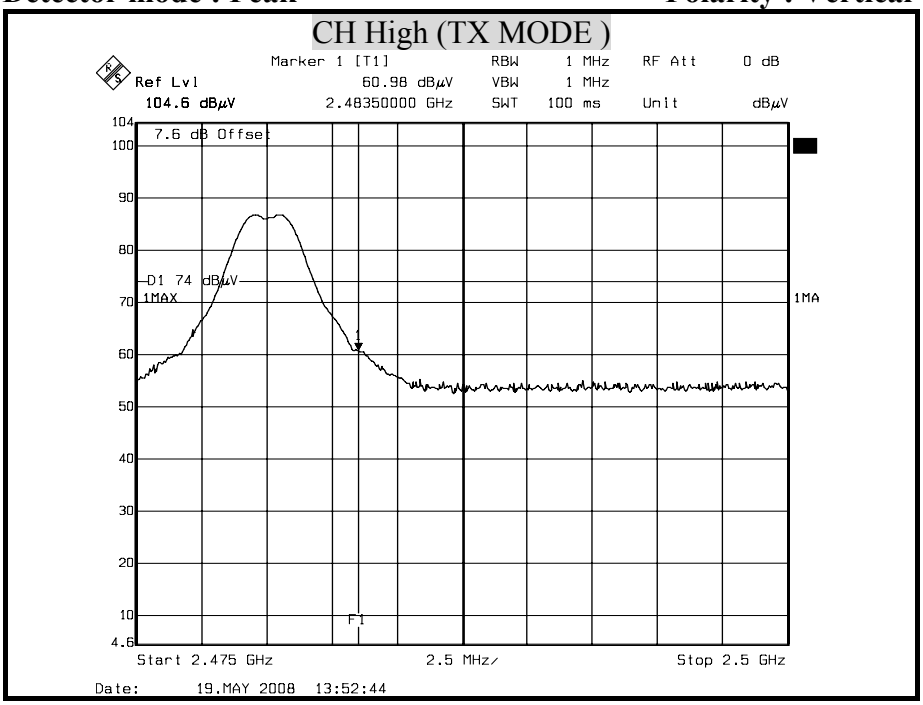
Detector mode : Average **Polarity : Horizontal**



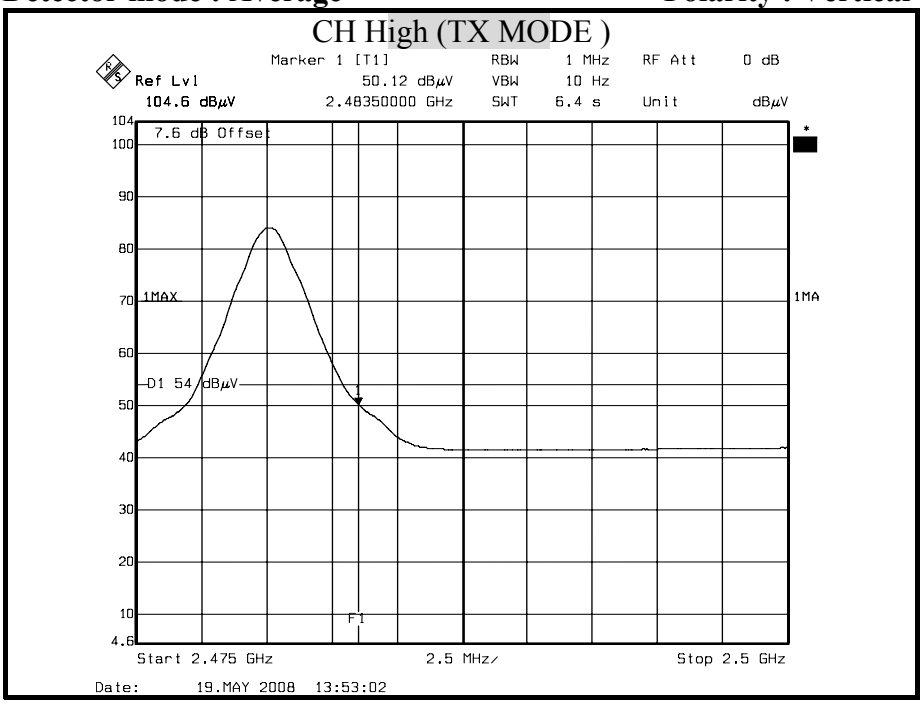
Remark:

1. Display Line = 54/74 dB μ V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.6(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.62(dB)

Detector mode : Peak **Polarity : Vertical**



Detector mode : Average **Polarity : Vertical**



Remark:

1. Display Line = 54/74 dB μ V/m.
2. 2390MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.6(dB)
3. 2483.5MHz Offset(dB) = Antenna Factor(dB/m) + Cable Loss(dB) - Pre-Amplifier(dB) + Attenuator(dB)=7.62(dB)

8.7 POWERLINE CONDUCTED EMISSIONS

LIMITS

§ 15.207 (a) Except as shown in paragraph (b) and (c) this section, for an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal.

The lower limit applies at the boundary between the frequency ranges.

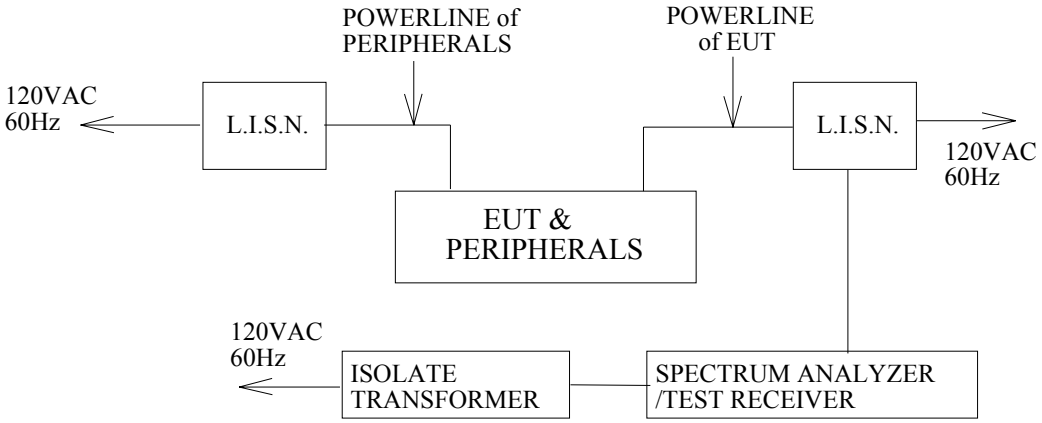
Frequency of Emission (MHz)	Conducted limit (dBμv)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

TEST EQUIPMENTS

The following test equipments are used during the conducted power line tests：

Conducted Emission room				
Name of Equipment	**Manufacturer**	**Model**	**Serial Number**	**Calibration Due**
L.I.S.N.	SCHWARZBECK	NNLK 8121	8121-446	NOV. 14, 2008 For Insertion loss
	Rohde & Schwarz	ESH 3-Z5	840062/021	SEP. 28, 2008
TEST RECEIVER	Rohde & Schwarz	ESCS 30	100348	JUN. 27, 2008
TYPE N COAXIAL CABLE	SUHNER	--------	----------	FEB. 26, 2009
Test S/W	e-3 (5.04211c) R&S (2.27)			

TEST SETUP



TEST PROCEDURE

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80cm above the horizontal ground plane. The EUT IS CONFIGURED IN ACCORDANCE WITH ANSI C63.4.

The resolution bandwidth is set to 9 kHz for both quasi-peak detection and average detection measurements.

Line conducted data is recorded for both NEUTRAL and LINE.

TEST RESULTS

No non-compliance noted.

CONDUCTED RF VOLTAGE MEASUREMENT

NOTE: This EUT has not connection to AC Source directly. No applicability for this test.

9. ANTENNA REQUIREMENT

9.1 STANDARD APPLICABLE

For intentional device, according to FCC 47 CFR Section 15.203, 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.

And according to FCC 47 CFR Section 15.247 (b), if transmitting antennas of directional gain greater than 6dBi are used, the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6dBi.

9.2 ANTENNA CONNECTED CONSTRUCTION

The antenna used for this product is a multilayer ceramic antenna. The peak Gain of this antenna is 2.08 dBi at 2.4GHz.