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

TEST REPORT

For

Bluetooth Audio Receiver

Model : GMHSBTAR

Data Applies To :

GBTIPOD-B、GBTIPOD-N、GBTIPOD-Z

GBTIPODM-B、GBTIPODM-N、GBTIPODM-Z

Issued for

Billionton Systems Inc.

No. 21, Sui-Lih Rd, Hsin-Chu, 300, Taiwan

Issued by

Compliance Certification Services Inc.
Hsinchu Lab.
Rm. 258, Bldg. 17, NO.195, Sec.4 Chung HsingRd.,
ChuTung Chen, Hsinchu, Taiwan 310, R.O.C
TEL: (03) 591-0068
FAX: (03) 582-5720

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1. TEST REPORT CERTIFICATION

Applicant	：Billionton Systems Inc.
Address	：No. 21, Sui-Lih Rd, Hsin-Chu, 300, Taiwan
Equipment Under Test	：Bluetooth Audio Receiver
Model	：GMHSBTAR
Data Applies To	：GBTIPOD-B、GBTIPOD-N、GBTIPOD-Z GBTIPODM-B、GBTIPODM-N、GBTIPODM-Z
Tested Date	：November 30 ~ December 12, 2005

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

Approved by: ***Reviewed by:***

C. F. Wu
Manager of Hsinchu Laboratory
Compliance Certification Services Inc.

Nicky Liu
Test Engineer of Hsinchu Laboratory
Compliance Certification Services Inc.

WE HEREBY CERTIFY THAT: The measurements shown in the attachment were made in accordance with the procedures indicated, and the energy emitted by the equipment was found to be within the limits applicable. We assume full responsibility for the accuracy and completeness of these measurements and vouch for the qualifications of all persons taking them.

2. EUT DESCRIPTION

2.1 DESCRIPTION OF EUT & POWER

Product Name	Bluetooth Audio Receiver
Model Number	GMHSBTAR
Data Applies To	GBTIPOD-B、GBTIPOD-N、GBTIPOD-Z、GBTIPODM-B、GBTIPODM-N、GBTIPODM-Z
Frequency Range	2402MHz to 2480MHz f = 2402 + nMHz, n = 0, …..78
Transmit Power	1.84dBm
Channel Spacing	1MHz
Channel Number	79
Air Data Rate	GFSK (1Mbps), π/4-DQPSK(2Mbps), 8-DPSK(3Mbps)
Type of Modulation	Frequency Hopping Spread Spectrum
Frequency Selection	by software / firmware
Transmitter Classification	portable device
Antenna Type	Dipole Antenna, Antenna Gain : 1.2 dBi
Power Source	5VDC (From Power Adapter)
RF Exposure Evaluation	Since the EUT is classed portable device, and the maximum peak power is 1.84dBm (<13.6dBm), the MPE evaluation is not required and no SAR consideration applied.

Power Adapter :

No.	Manufacturer	Model No.	Power Input	Power Output
1	TECHNICS	TESA5-0500700d-B	100-240VAC-50/60Hz, MAX 0.15A	5VDC, 0.3A

Multiple List :

Company	Sample name	Model Name
Sitecom	Mini Ipod transmitter	CN-534、CN-535

Remark : *For more details, please refer to the User's manual of the EUT.*

3. 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.

4. FACILITIES AND ACCREDITATIONS

4.1 FACILITIES

All measurement facilities used to collect the measurement data are located at Rm.258, Bldg.17, NO.195 , Sec. 4, Chung Hsing Rd., Chu-Tung Chen. Hsin-Chu, Taiwan 310 R.O.C.
The sites are constructed in conformance with the requirements of ANSI C63.7, ANSI C63.4 and CISPR Publication 22.

4.2 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.”

4.3 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: 200118-0 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: 90585 and 90584).

4.4 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	200118-0
USA	FCC	3/10 meter Open Area Test Sites to perform FCC Part 15/18 measurements	90585, 90584
Japan	VCCI	3/10 meter Open Area Test Sites to perform conducted/radiated measurements	R-1229/1189 C-1250/1294
Taiwan	CNLA	FCC Method-47 CFR Part 15 Subpart C,D,E CISPR 11, FCC METHOD-47 CFR Part 18, EN 55011, CNS 13803, CISPR 13, CNS 13439, FCC Method-47 CFR Part 15 Subpart B, CISPR 14-1, EN 55014-1, CNS 13783-1, EN 55015, CNS 14115, CISPR 22, EN 55022, VCCI CNS 13438, EN 61000-4-2/3/4/5/6/8/11	0240
Taiwan	BSMI	CNS 13803, CNS 13438, CNS 13439, CNS 13783-1, CNS 14115	SL2-IS-E-0002 SL2-IN-E-0002 SL2-A1-E-0002 SL2-R1-E-0002 SL2-R2-E-0002 SL2-L1-E-0002
Canada	Industry Canada	RSS212, Issue 1	IC 4417-1

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

5. CALIBRATION AND UNCERTAINTY

5.1 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.

5.2 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 26.5GHz	+/- 3.2 dB
Power Line Conducted Emission	+/- 2.1 dB

Uncertainty figures are valid to a confidence level of 95%

6. DESCRIPTION OF TEST MODES

There are three channels have been tested as following:

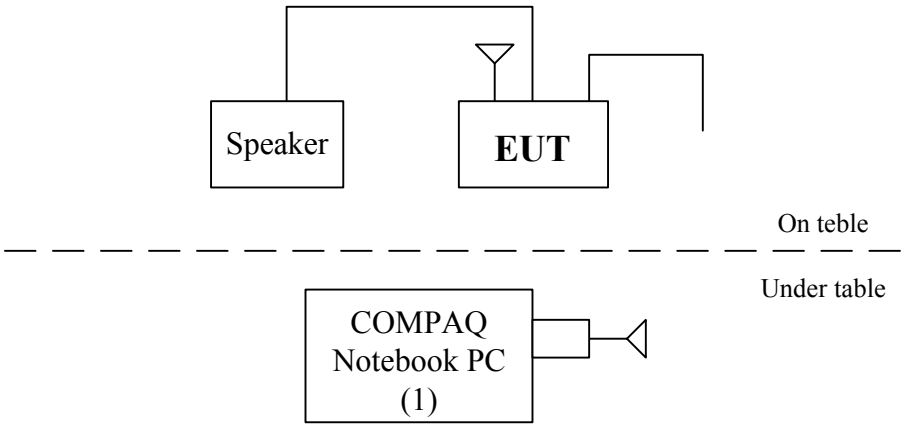
Channel	Frequency (MHz)
Low	2402
Middle	2441
High	2480

7. SETUP OF EQUIPMENT UNDER TEST

SUPPORT EQUIPMENT

No.	Product	Manufacturer	Model No.	Serial No.	FCC ID
1	Notebook PC	COMPAQ	N 800V	5Y33KSQZMOXV1YR	DoC
2	Bluetooth Dongle	MOTOROLA	PC850	0532OS1-0403532	QVZ58905341
3	Speaker	JS	J-360	----------	----------

SETUP DIAGRAM FOR TESTS



EUT OPERATING CONDITION

1. Setup all computers like the setup diagram.
2. Run CSR Blue Test software.
3. TX mode
   TXSTART
   LO Freq: 2402,2441,2480
   Power (EXT,Int): 255,40
   Modulation Freq:0
4. RX mode
   RXSTART1
   LO Freq: 2402,2441,2480
   RX Attenuation 0
5. All of the function are under run.
6. Start test.

8. APPLICABLE LIMITS AND TEST RESULTS

8.1 20dB BANDWIDTH FOR HOPPING

LIMIT

Limit : N/A

TEST EQUIPMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005

TEST SETUP

TEST PROCEDURE

The 20dB band width was measured with a spectrum analyzer connected to RF antenna connector(conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency. The analyzer center frequency was set to the EUT carrier frequency, using the analyzer. Display Line and Marker Delta functions, the 20dB band width of the emission was determined.

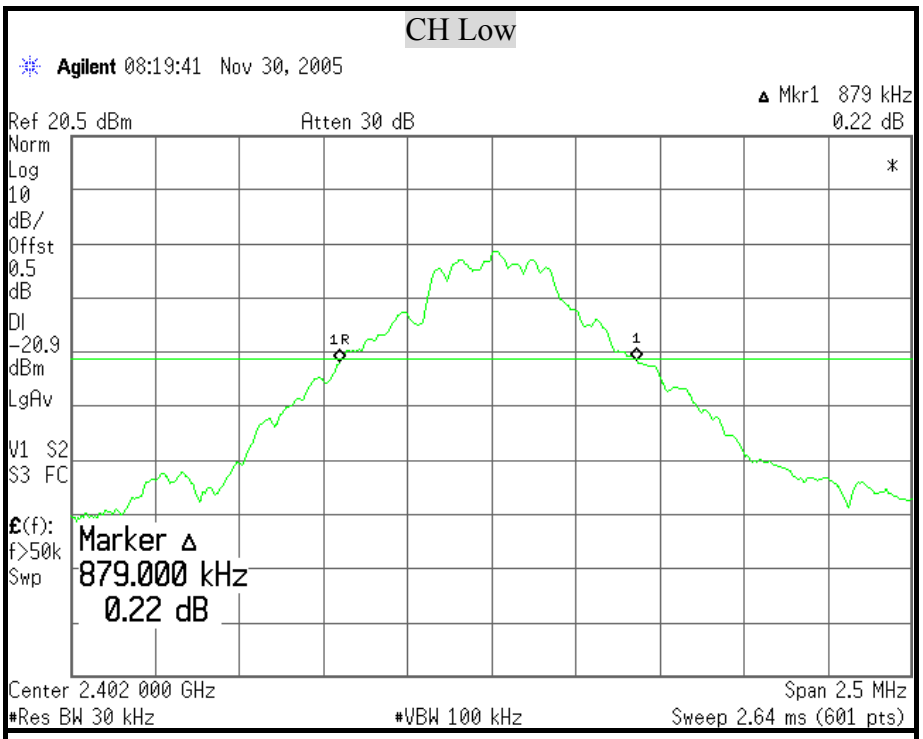
TEST RESULTS

No non-compliance noted

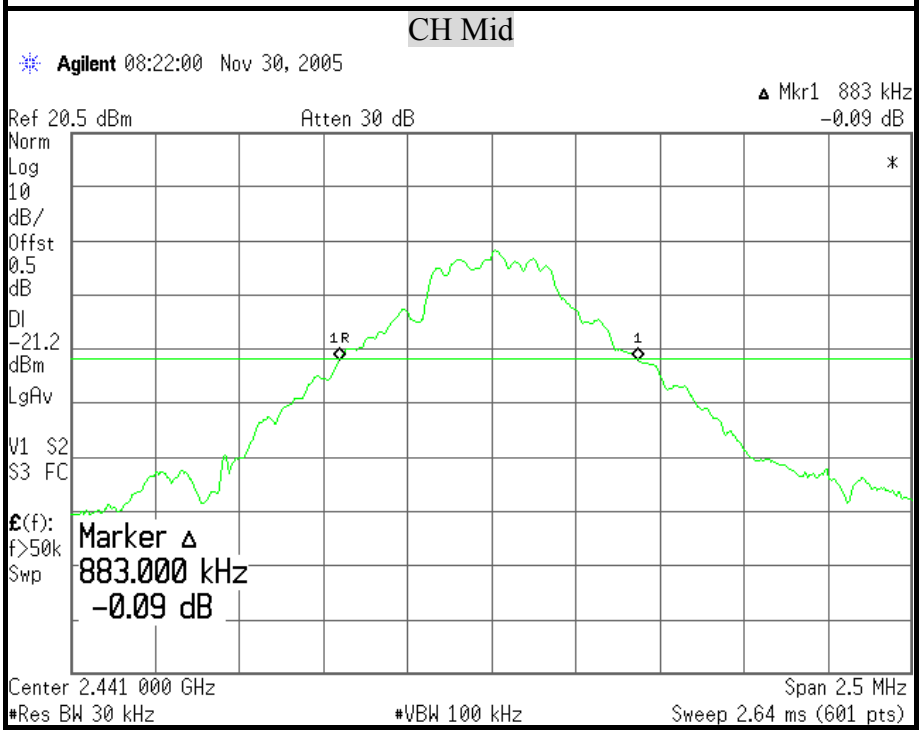
Channel	Channel Frequency (MHz)	20dB Bandwidth (kHz)	Pass / Fail
Low	2402	879	N/A
Middle	2441	883	N/A
High	2480	854	N/A

20dB BANDWIDTH

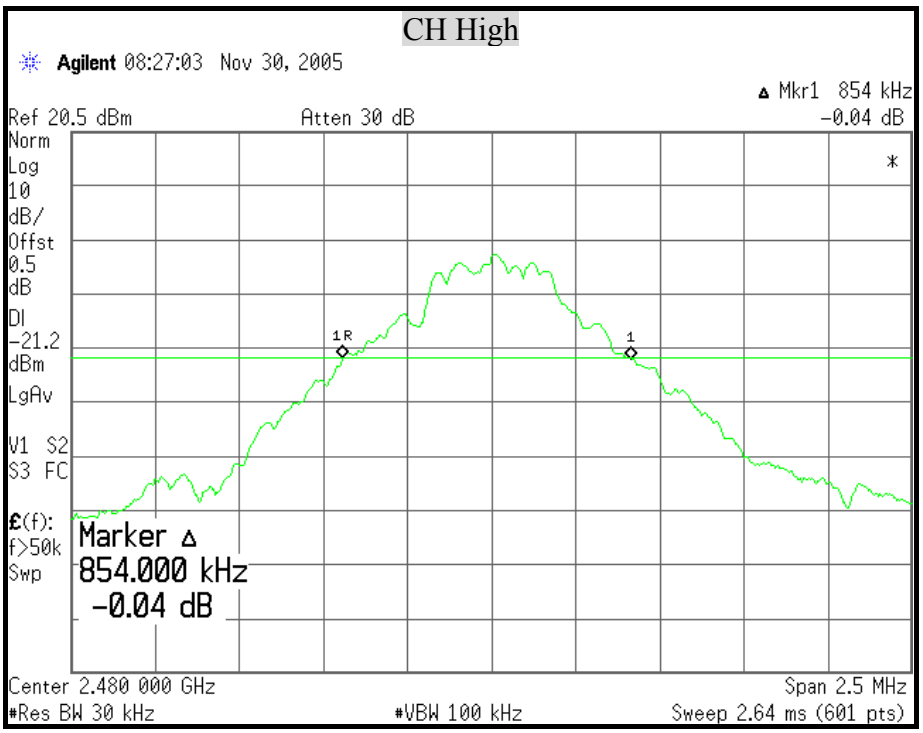
CH Low



CH Mid



CH High


Agilent 08:27:03 Nov 30, 2005
Mkr1 854 kHz
Ref 20.5 dBm
Atten 30 dB
-0.04 dB
Norm
Log
10
dB/
Offst
0.5
dB
Dl
-21.2
dBm
LgAv
V1 S2
S3 FC
£(f):
f>50k
Swp
1R
1
Marker Δ
854.000 kHz
-0.04 dB
Center 2.480 000 GHz
Span 2.5 MHz
#Res BW 30 kHz
#VBW 100 kHz
Sweep 2.64 ms (601 pts)

8.2 MAXIMUM PEAK OUTPUT POWER

LIMIT

§15.247(b)(1) The Maximum Peak Output Power Measurement is 125mW for frequency hopping systems operating in 2400~2483.5 MHz employing at least 15 hopping channels.

TEST EQUIPMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005

TEST SETUP

TEST PROCEDURE

The RF power output was measured with a Spectrum analyzer connected to the RF Antenna connector (conducted measurement) while EUT was operating in transmit mode at the appropriate center frequency, A spectrum analyzer was used to record the shape of the transmit signal.

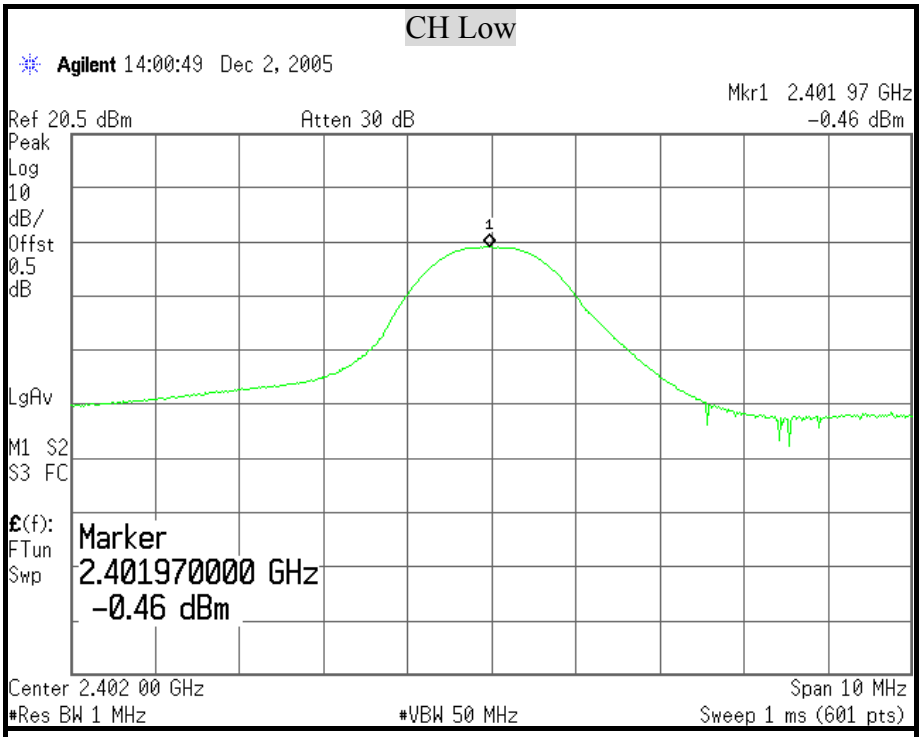
TEST RESULTS

No non-compliance noted

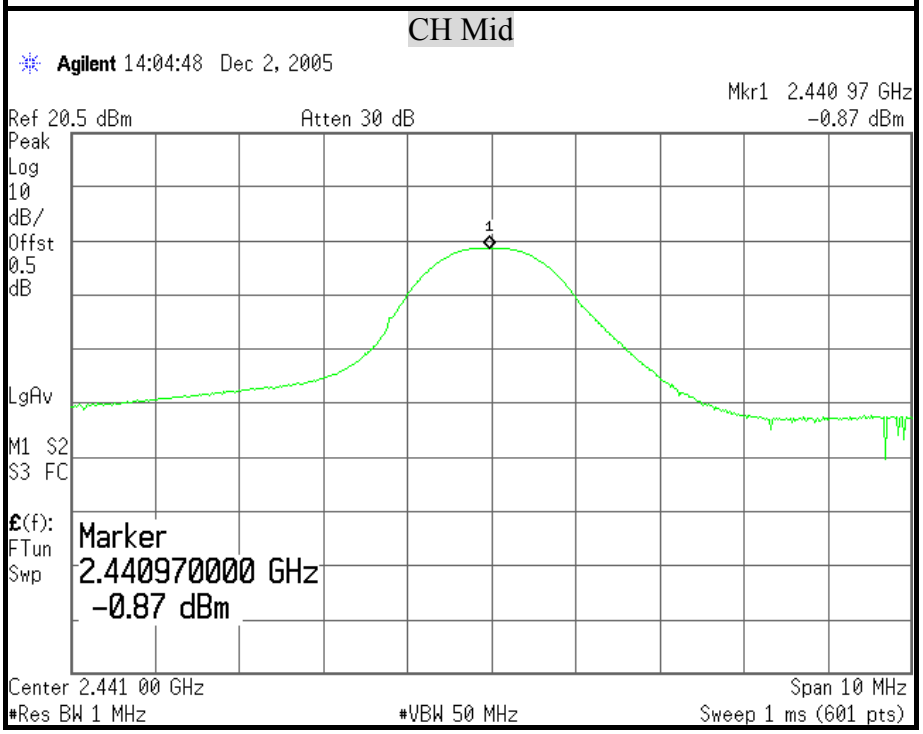
Channel	Channel Frequency (MHz)	Peak Power Output (dBm)	Peak Power Limit (dBm)	Pass / Fail
Low	2402	-0.46	20.97	PASS
Middle	2441	-0.87	20.97	PASS
High	2480	-1.80	20.97	PASS

MAXIMUM PEAK OUTPUT POWER

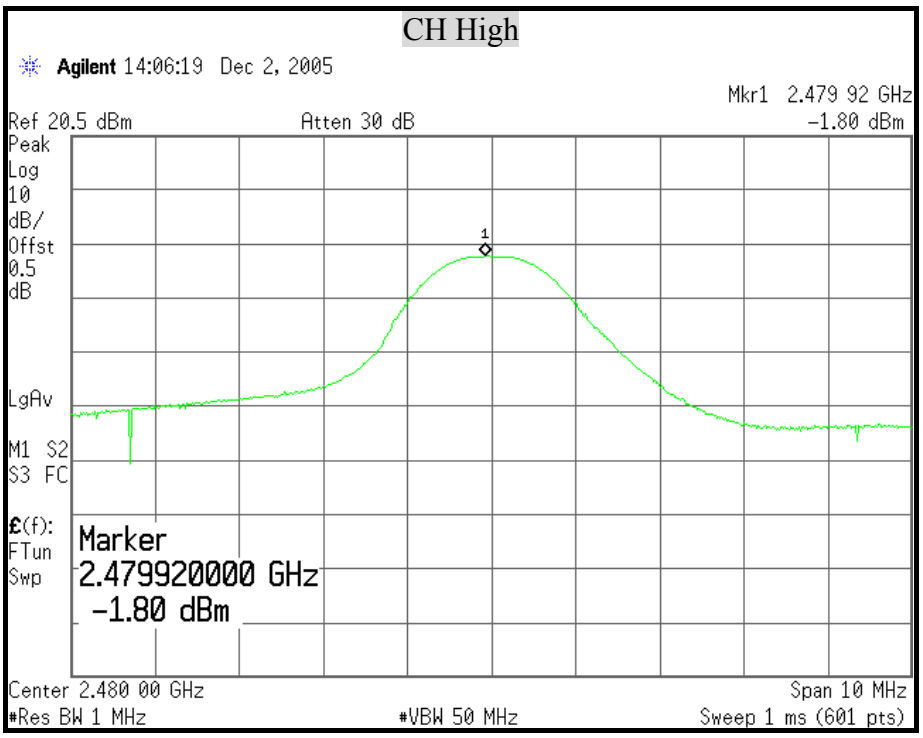
CH Low



CH Mid



CH High


Agilent 14:06:19 Dec 2, 2005
Mkr1 2.479 92 GHz
Ref 20.5 dBm
Atten 30 dB
-1.80 dBm
Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
£(f):
FTun
Swp
Marker
2.479920000 GHz
-1.80 dBm
Center 2.480 00 GHz
Span 10 MHz
#Res BW 1 MHz
#VBW 50 MHz
Sweep 1 ms (601 pts)

8.3 HOPPING CHANNEL SEPARATION

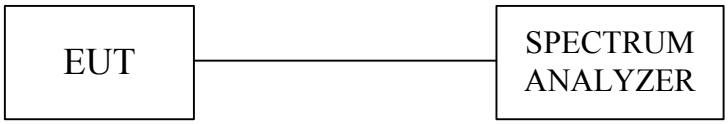
LIMIT

§15.247(a)(1) Frequency hopping system operating in 2400-2483.5MHz. Band may have hopping channel carrier frequencies that are separated by 25kHz or two-third of 20dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

TEST EQUIPMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005

TEST SETUP



TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect it to measurement instrument. Then set it to any one convenient frequency within its operating range.
3. By using the MaxHold function record the separation of adjacent channels.
4. Measure the frequency difference of these two adjacent channels by spectrum analyzer MARK function. And then plot the result on spectrum analyzer screen.
5. Repeat above procedures until all frequencies measured were complete.

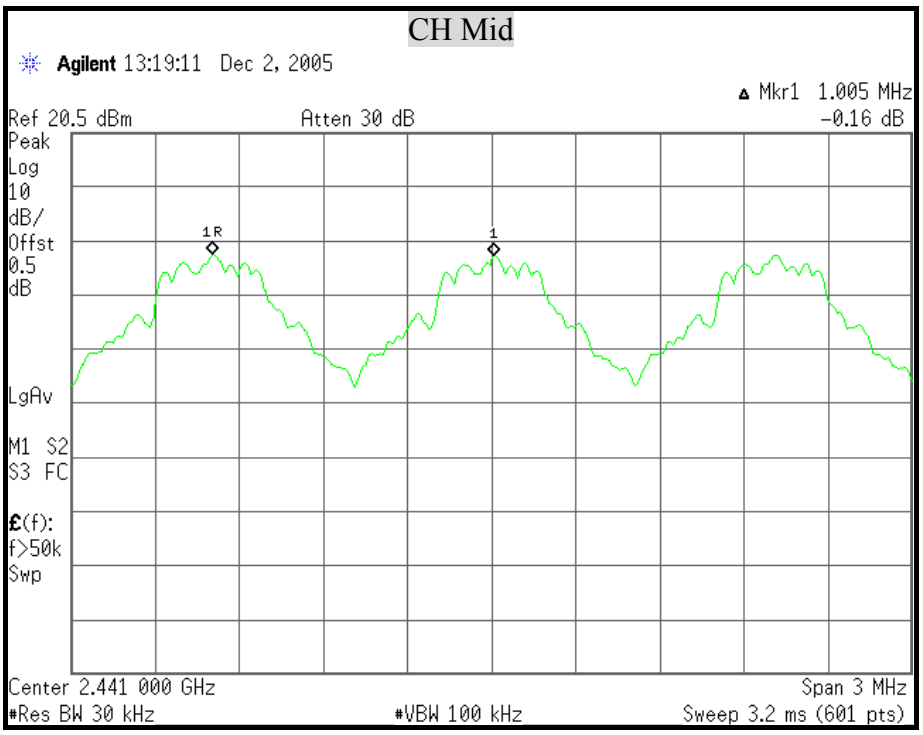
TEST RESULTS

No non-compliance noted

Refer to section 7.1, 20dB bandwidth measurement, the measured channel separation should be greater than two-third of 20dB bandwidth or Minimum bandwidth.

Channel	Adjacent Hopping Channel Separation (kHz)	Two –third of 20dB bandwidth (kHz)	Minimum Bandwidth	Result
2441MHz (Mid)	1005	883	25 kHz	PASS

HOPPING CHANNEL SEPARATION



8.4 NUMBER OF HOPPING FREQUENCY USED

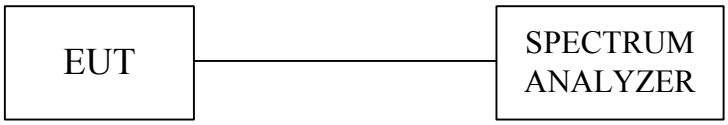
LIMIT

§15.247(a)(1)(iii) For frequency hopping system operating in the 2400-2483.5MHz bands shall use at least 15 hopping frequencies

TEST EQUIPMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005

TEST SETUP



TEST PROCEDURE

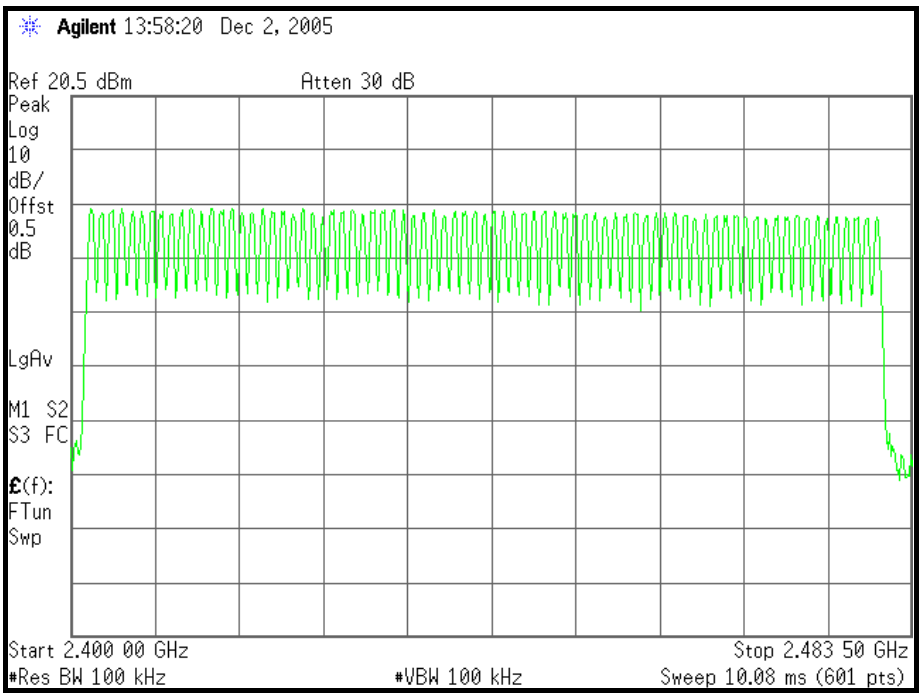
1 Check the calibration of the measuring instrument (spectrum analyzer) using either an internal calibrator or a known signal from an external generator.
2 Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3 Set the spectrum analyzer on MaxHold Mode, and then keep the EUT in hopping mode. Record all the signals from each channel until each one has been recorded.
4 Set the spectrum analyzer on View mode and then plot the result on spectrum analyzer screen.
5 Repeat above procedures until all frequencies measured were complete.

TEST RESULTS

No non-compliance noted

Refer to the attached plot.
There are 79 hopping frequencies in a hopping sequence.

NUMBER OF HOPPING FREQUENCY USED



8.5 DWELL TIME ON EACH CHANNEL

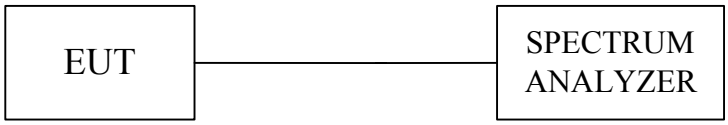
LIMIT

§15.247(a)(1)(iii) For frequency hopping system operating in the 2400-2483.5MHz band, the average time of occupancy on any frequency shall not be greater than 0.4 second within a 31.6 second period.

TEST EQUIPMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005

TEST SETUP



TEST PROCEDURE

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT as shown in test setup without connection to measurement instrument. Turn on the EUT and connect its antenna terminal to measurement instrument via a low loss cable. Then set it to any one measured frequency within its operating range and make sure the instrument is operated in its linear range.
3. Adjust the center frequency of spectrum analyzer on any frequency be measured and set spectrum analyzer to zero span mode. And then, set RBW and VBW of spectrum analyzer to proper value.
4. Measure the time duration of one transmission on the measured frequency. And then plot the result with time difference of this time duration.
5. Repeat above procedures until all frequencies measured were complete.
6. The Bluetooth Audio Receiver has 3 type of payload, DH1, DH3, DH5. The hopping rate is 1600 per second.
   The longer the payload is, the slower the hopping rate is.

TEST RESULTS

No non-compliance noted

Time of occupancy on the TX channel in 31.6sec = time domain slot length × hop rate ÷ number of hop per channel × 31.6

Refer to the attached graph.

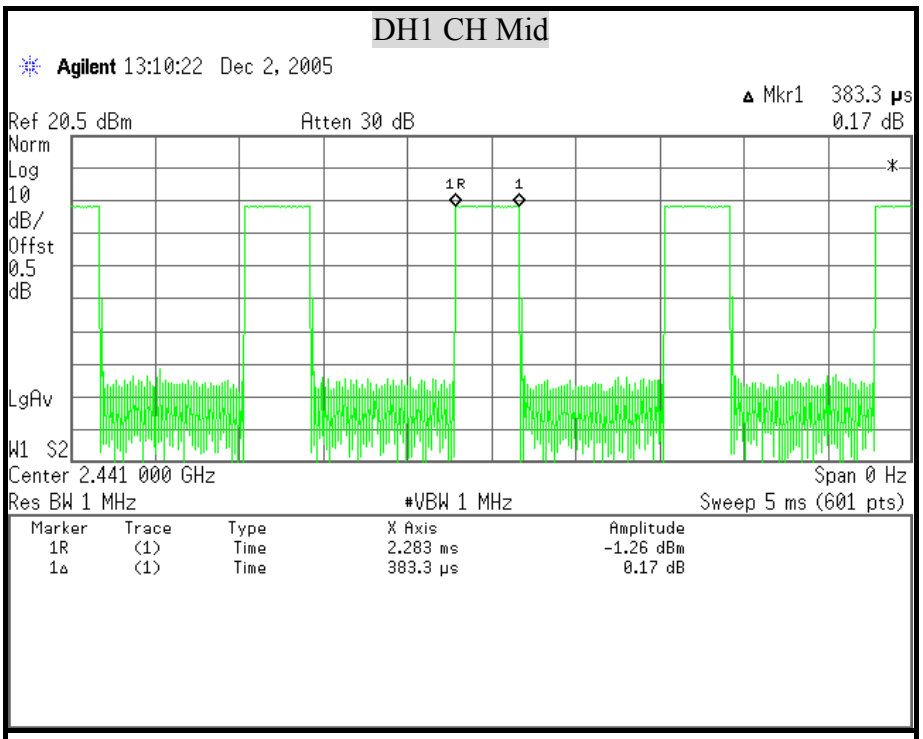
The hopping rates of Bluetooth devices change with different types of payload. The longer the payload is, the slower the hopping rate. The hopping rate scenario is defined in Bluetooth core specification.

Transmitting Frequency	Packet type	Dwell time (ms)	Time of occupancy on the TX channel in 31.6sec (ms)	Limit for Time of occupancy on the TX channel in 31.6sec (ms)	Results
2441MHz	DH1	0.3833	122.87	400	PASS
2441MHz	DH3	1.6500	263.99	400	PASS
2441MHz	DH5	2.8750	306.66	400	PASS

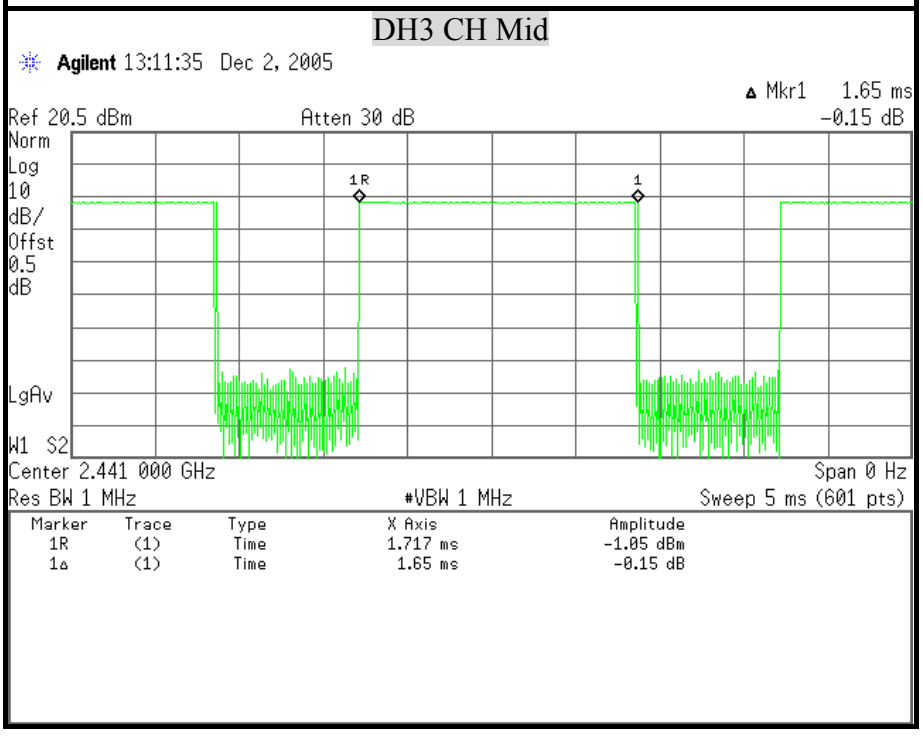
DH1 Dwell time = 0.3833 ms × (1600÷2) ÷ 79 × 31.6 = 122.87 (ms)
DH3 Dwell time = 1.6500 ms × (1600÷4) ÷ 79 × 31.6 = 263.99 (ms)
DH5 Dwell time = 2.8750 ms × (1600÷6) ÷ 79 × 31.6 = 306.66 (ms)

DWELL TIME ON EACH PAYLOAD

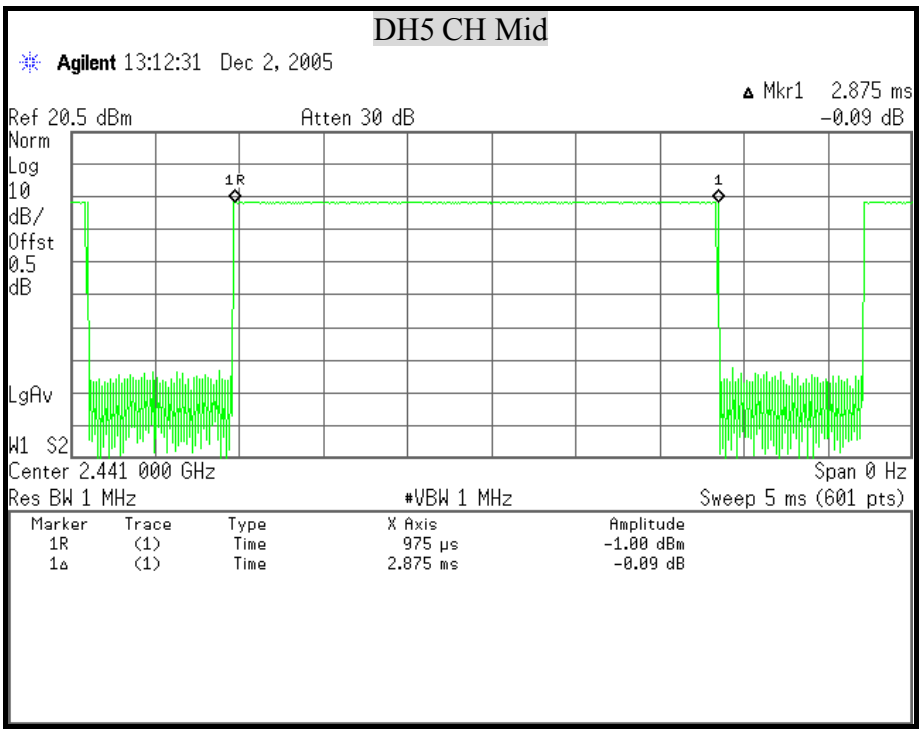
DH1 CH Mid



DH3 CH Mid



DH5 CH Mid


Agilent 13:12:31 Dec 2, 2005
Mkr1 2.875 ms
Ref 20.5 dBm
Atten 30 dB
-0.09 dB
Norm
Log
10
dB/
Offst
0.5
dB
1R
1
LgAv
W1 S2
Center 2.441 000 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 975 µs -1.00 dBm
1Δ (1) Time 2.875 ms -0.09 dB

8.6 POWER SPECTRAL DENSITY MEASUREMENT

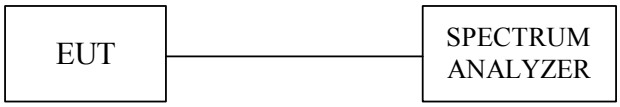
LIMIT

§15.247(e) The peak power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8dBm in any 3kHz band during any time interval of continuous transmission

TEST EQUIPMENTS

Description & Manufacturer	Model No.	Serial No.	Date of Calibration
ROHDE & SCHWARZ SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005

TEST SETUP



TEST PROCEDURE

The transmitter output was connected to the spectrum analyzer through an attenuator, the bandwidth of the fundamental frequency was measured with the spectrum analyzer using 3KHz RBW and 30KHz VBW, 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.

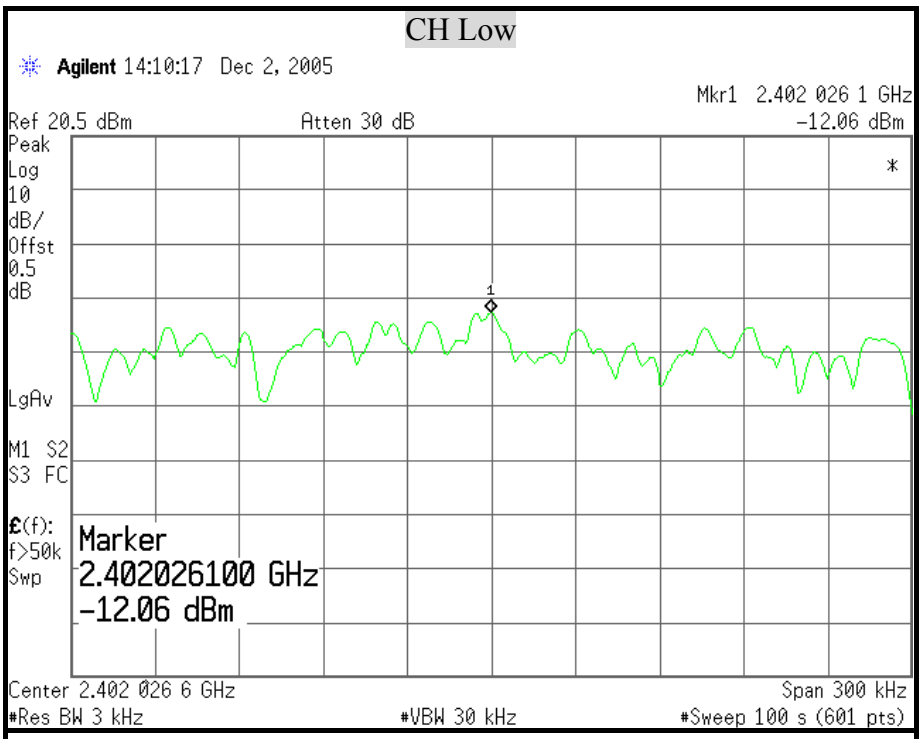
TEST RESULTS

No non-compliance noted

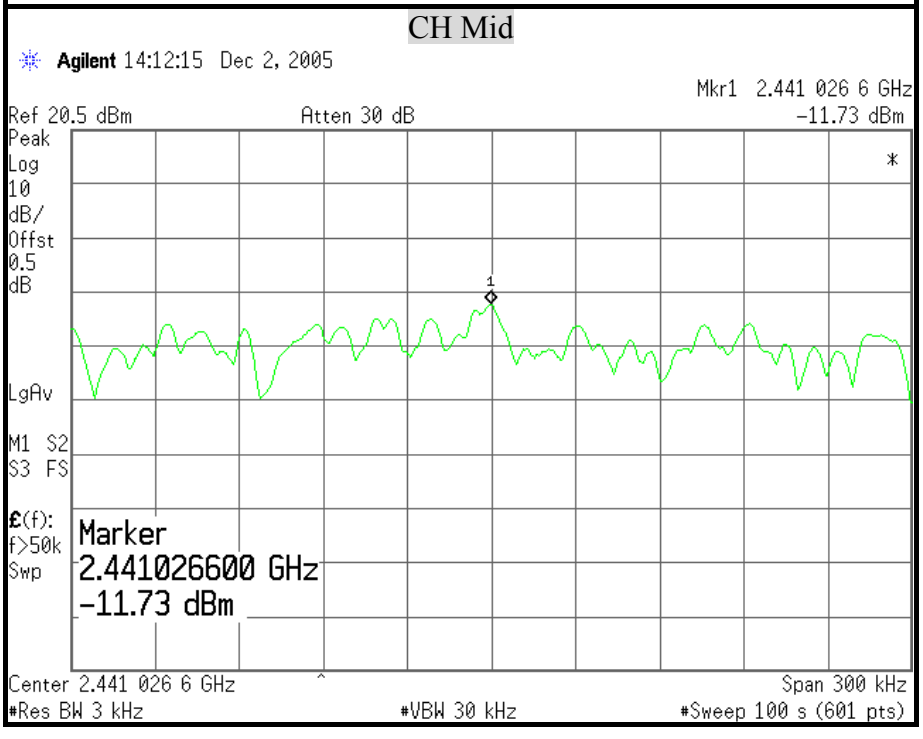
Channel	Channel Frequency (MHz)	Final RF Power Level in 3KHz BW (dBm)	Maxmum Limit (dBm)	Pass / Fail
01(Low)	2402	-9.35	8	PASS
40(Mid)	2441	-9.32	8	PASS
79(High)	2480	-9.20	8	PASS

POWER SPECTRAL DENSITY MEASUREMENT

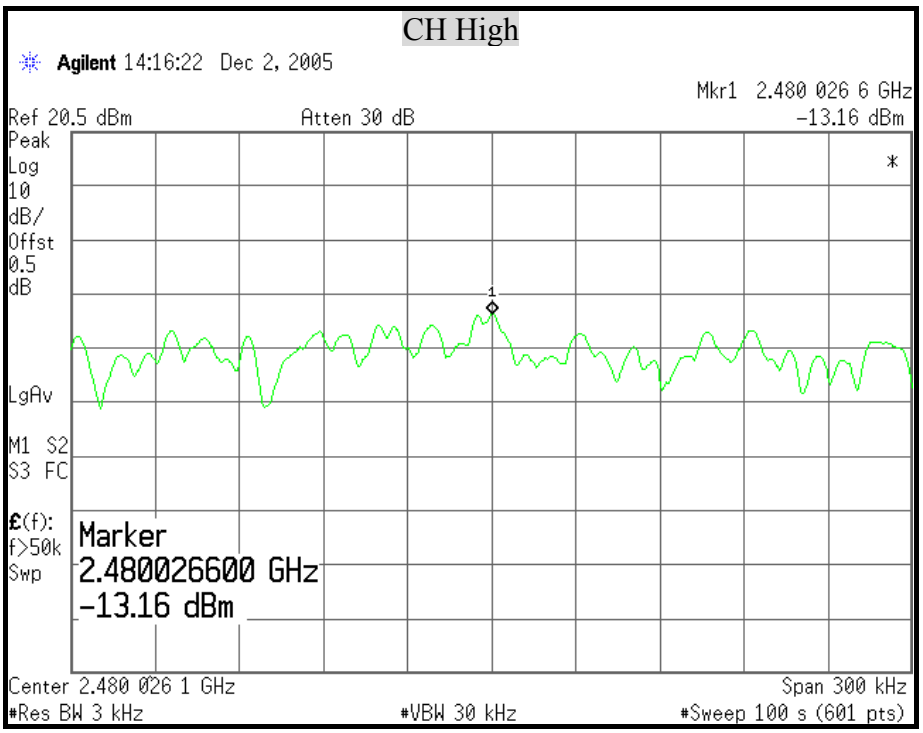
CH Low



CH Mid



CH High


Agilent 14:16:22 Dec 2, 2005
Mkr1 2.480 026 6 GHz
Ref 20.5 dBm
Atten 30 dB
-13.16 dBm
Peak
Log
10
dB/
Offst
0.5
dB
LgAv
M1 S2
S3 FC
£(f):
f>50k
Swp
Marker
2.480026600 GHz
-13.16 dBm
Center 2.480 026 1 GHz
Span 300 kHz
#Res BW 3 kHz
#VBW 30 kHz
#Sweep 100 s (601 pts)

8.7 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 100 kHz.

The spectrum from 30 MHz to 26.5 GHz is investigated with the transmitter set to the lowest, middle, and highest channels in the 2.4 GHz band.

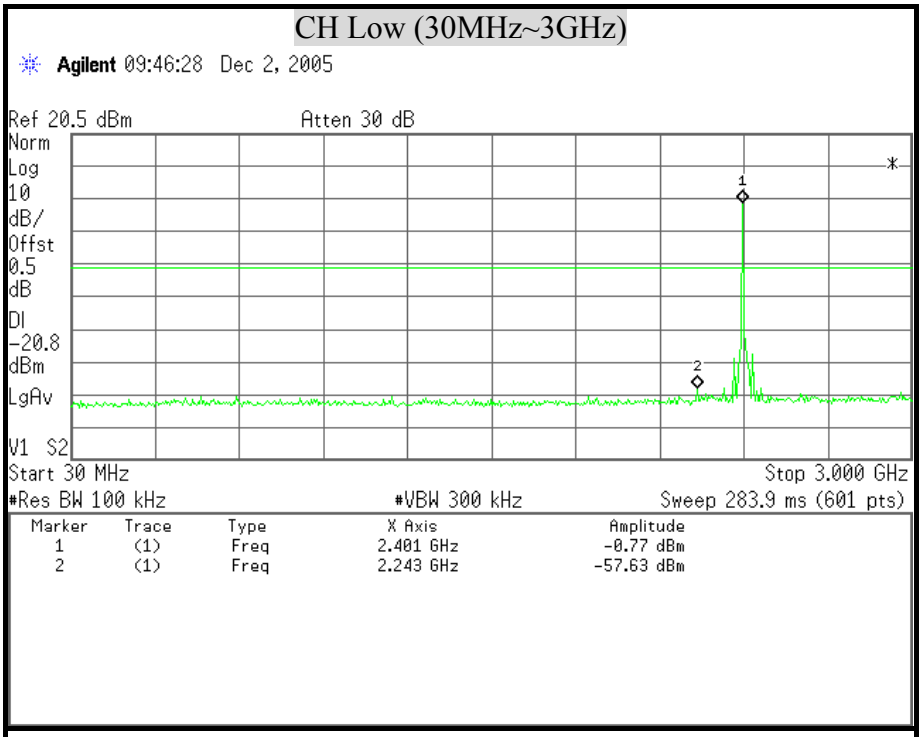
TEST RESULTS

No non-compliance noted

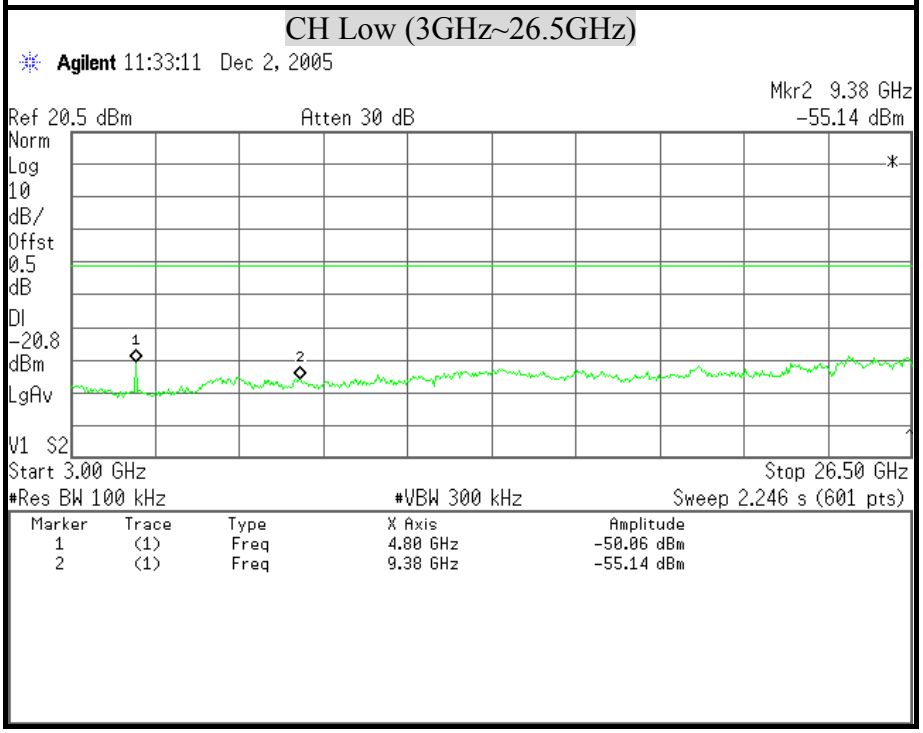
BAND EDGE COMPLIANCE OF RF CONDUCTED EMISSIONS

OUT-OF-BAND SPURIOUS EMISSIONS-CONDUCTED MEASUREMENT

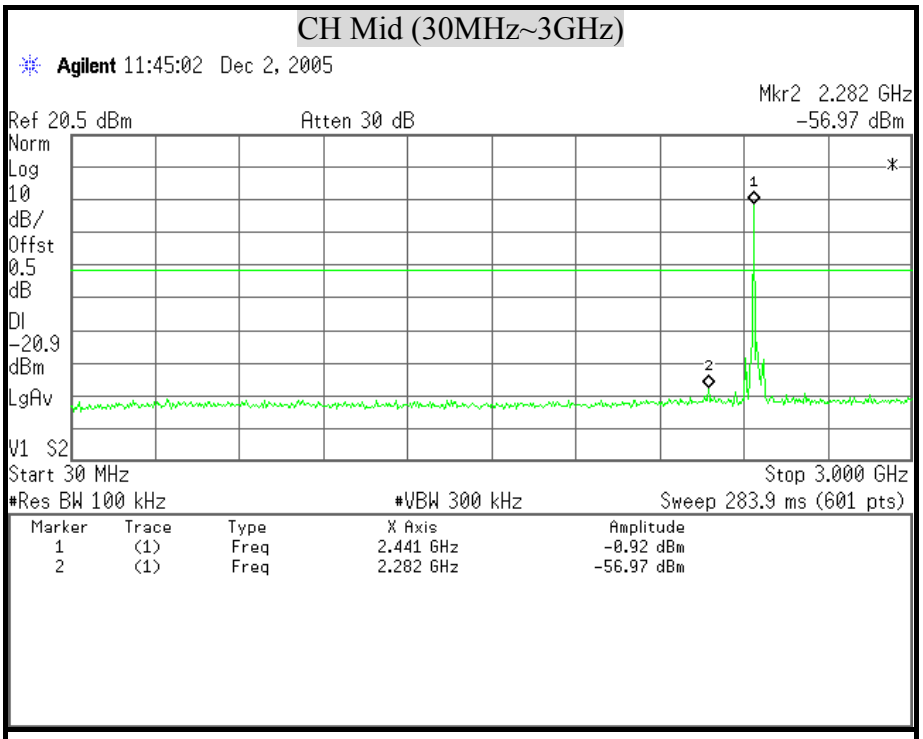
CH Low (30MHz~3GHz)



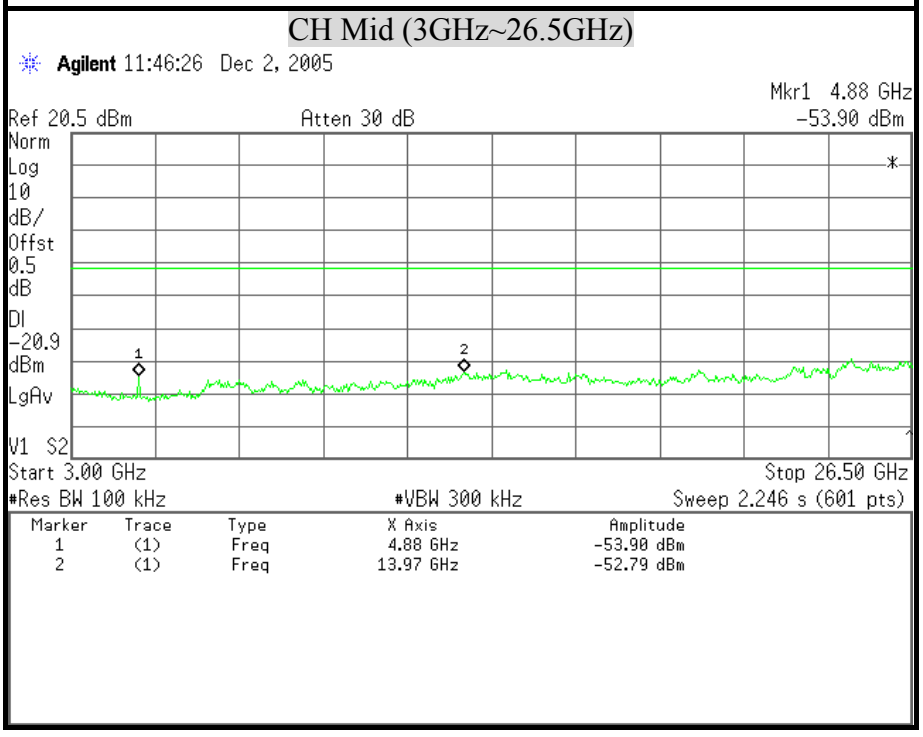
CH Low (3GHz~26.5GHz)



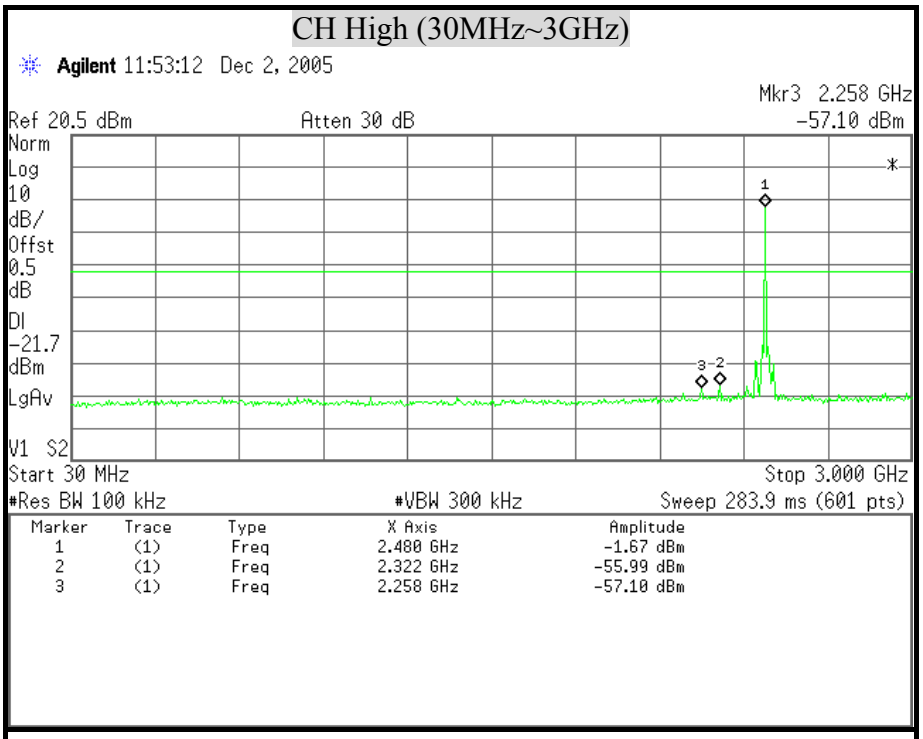
CH Mid (30MHz~3GHz)



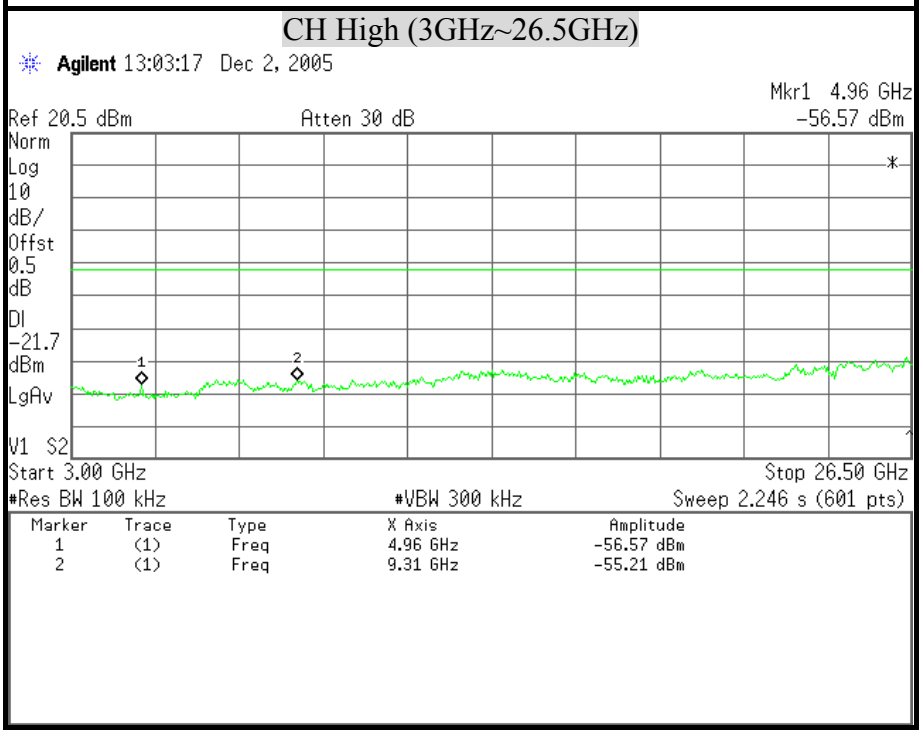
CH Mid (3GHz~26.5GHz)



CH High (30MHz~3GHz)



CH High (3GHz~26.5GHz)



8.8 RADIATED EMISSIONS

8.8.1 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.

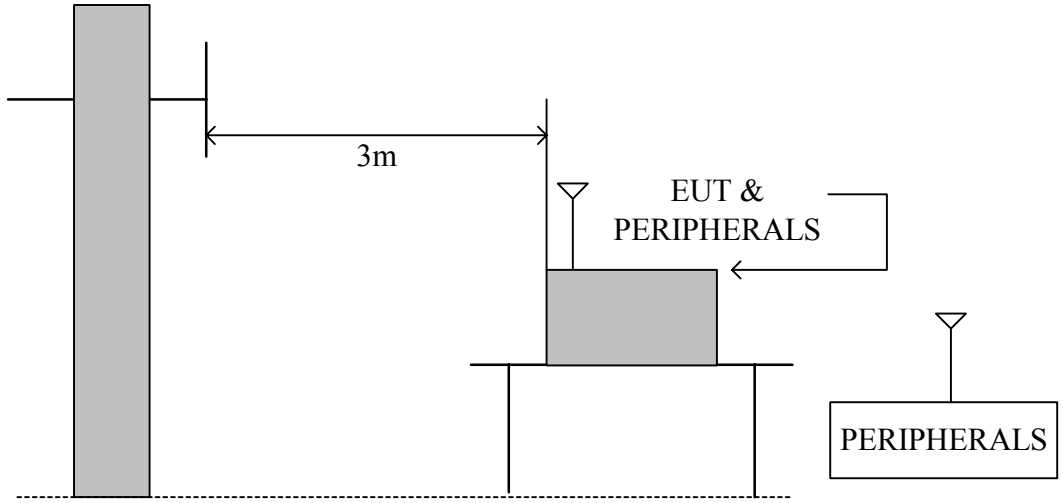
TEST EQUIPMENTS

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

Manufacturer or Type	Model No.	Serial No.	Date of Calibration	Calibration Period	Remark
CHASE BI-LOG ANTENNA	CBL6112B	2817	March 22, 2005	1 Year	FINAL
R/S SPECTRUM ANALYZER	FSEK30	835253/002	September 24, 2005	1 Year	FINAL
AGILENT SPECTRUM ANALYZER	E4446A	MY433601.32	January 26, 2005	1 Year	FINAL
R/S EMI TEST RECEIVER	ESCS30	835418/008	August 24, 2005	1 Year	FINAL
OPEN SITE	----------	No.2	May 07, 2005	1 Year	FINAL
N TYPE COAXIAL CABLE	9913-30M	----------	July 28, 2005	1 Year	FINAL
Horn Antenna	AH-118	10089	August 10, 2005	1 Year	FINAL
HP Pre-amplifier	8449B	3008A01471	November 24, 2004	1 Year	FINAL
HP High pass filter	84300/80038	002	CAL. ON USE	1 Year	FINAL

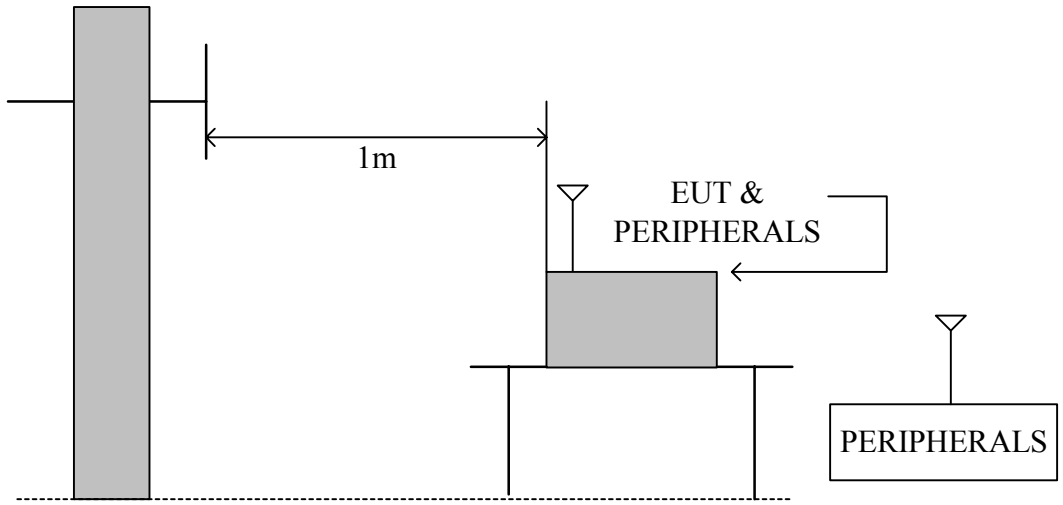
TEST SETUP

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 1 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.

TEST RESULTS

No non-compliance noted

8.8.2 WORST-CASE RADIATED EMISSION BELOW 1 GHz

Product Name	Bluetooth Audio Receiver	**Test Date**	2005/12/01
Model Name	GMHSBTAR	**Test By**	Nikcy Liu
Test Mode	CH Low TX	**TEMP & Humidity**	26.3°C, 52%

Frequency (MHz)	Antenna Factor (dB/m)	Cable Loss (dB)	Meter Reading at 3m(dBμV)		Limits (dBμV/m)	Emission Level at 3m(dBμV/m)	
			Horizontal	Vertical		Horizontal	Vertical
174.90	10.56	1.69	12.30	12.80	43.50	24.55	25.05
224.00	12.11	1.93	15.60	12.30	46.00	29.64	26.34
300.00	14.20	2.19	16.20	15.50	46.00	32.59	31.89
399.90	17.00	2.57	12.30	13.40	46.00	31.87	32.97
520.00	18.94	2.98	15.90	15.00	46.00	37.82	36.92
652.70	20.13	3.47	11.40	12.80	46.00	35.00	36.40

Remark:

1. Emission level (dBμV/m) =Antenna Factor (dB/m) + Cable loss (dB) + Meter Reading (dBμV).
2. According to technical experience, all spurious emission at channel Low, Middle and High are almost the same below 1GHz, so the spurious emission test result of the channel Low was chosen as representative in finial test.

8.8.3 TRANSMITTER RADIATED EMISSION ABOVE 1 GHz

Product Name	Bluetooth Audio Receiver	**Test Date**	2005/12/01
Model Name	GMHSBTAR	**Test By**	Nikcy Liu
Test Mode	CH Low TX	**TEMP & Humidity**	24°C, 80%

Measurement Distance at 1m Horizontal polarity											
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level 1m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
4804.10	57.45	34.33	6.32	35.14	9.50	0.37	53.83	74.00	-20.17	P	1.00
4804.10	39.56	34.33	6.32	35.14	9.50	0.37	35.94	54.00	-18.06	A	1.00
12011.04	49.22	41.71	10.58	35.79	9.50	0.45	56.67	74.00	-17.33	P	1.00
12011.04	34.23	41.71	10.58	35.79	9.50	0.45	41.68	54.00	-12.32	A	1.00

Measurement Distance at 1m Vertical polarity											
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level 1m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
4804.10	60.89	34.33	6.32	35.14	9.50	0.37	57.27	74.00	-16.73	P	1.00
4804.10	40.49	34.33	6.32	35.14	9.50	0.37	36.87	54.00	-17.13	A	1.00
12011.04	50.71	41.71	10.58	35.79	9.50	0.45	58.16	74.00	-15.84	P	1.00
12011.04	34.46	41.71	10.58	35.79	9.50	0.45	41.91	54.00	-12.09	A	1.00

Remark:

1. The measurement was searched to 10th harmonic.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
5. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
6. The other emission levels were 20dB below the limit
7. The test limit distance is 3M limit.

Product Name	Bluetooth Audio Receiver	Test Date	2005/12/01
Model Name	GMHSBTAR	Test By	Nikcy Liu
Test Mode	CH Middle TX	TEMP & Humidity	24°C, 80%

Measurement Distance at 1m Horizontal polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level 1m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
4882.00	59.68	34.60	6.32	35.21	9.50	0.29	56.18	74.00	-17.82	P	1.00
4882.00	40.76	34.60	6.32	35.21	9.50	0.29	37.26	54.00	-16.74	A	1.00
7323.00	61.70	39.61	8.30	35.64	9.50	0.82	65.30	74.00	-8.70	P	1.00
7323.00	42.40	39.61	8.30	35.64	9.50	0.82	46.00	54.00	-8.00	A	1.00
12205.00	48.27	41.91	10.52	35.60	9.50	0.38	55.98	74.00	-18.02	P	1.00
12205.00	35.27	41.91	10.52	35.60	9.50	0.38	42.98	54.00	-11.02	A	1.00

Measurement Distance at 1m Vertical polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level 1m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
4882.00	62.40	34.60	6.32	35.21	9.50	0.29	58.90	74.00	-15.10	P	1.00
4882.00	42.15	34.60	6.32	35.21	9.50	0.29	38.65	54.00	-15.35	A	1.00
7323.00	67.53	39.61	8.30	35.64	9.50	0.82	71.13	74.00	-2.87	P	1.00
7323.00	44.85	39.61	8.30	35.64	9.50	0.82	48.45	54.00	-5.55	A	1.00
12205.00	50.13	41.91	10.52	35.60	9.50	0.38	57.84	74.00	-16.16	P	1.00
12205.00	36.87	41.91	10.52	35.60	9.50	0.38	44.58	54.00	-9.42	A	1.00

Remark:

1. The measurement was searched to 10th harmonic.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
5. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
6. The other emission levels were 20dB below the limit
7. The test limit distance is 3M limit.

Product Name	Bluetooth Audio Receiver	**Test Date**	2005/12/01
Model Name	GMHSBTAR	**Test By**	Nikcy Liu
Test Mode	CH High TX	**TEMP & Humidity**	24°C, 80%

Measurement Distance at 1m Horizontal polarity

Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level 1m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
4960.00	56.80	34.86	6.32	35.27	9.50	0.21	53.43	74.00	-20.57	P	1.00
4960.00	38.82	34.86	6.32	35.27	9.50	0.21	35.45	54.00	-18.55	A	1.00
7440.00	50.39	39.87	8.35	35.61	9.50	0.72	54.21	74.00	-19.79	P	1.00
7440.00	35.60	39.87	8.35	35.61	9.50	0.72	39.42	54.00	-14.58	A	1.00
12400.00	44.92	42.10	10.46	35.40	9.50	0.32	52.90	74.00	-21.10	P	1.00
12400.00	33.47	42.10	10.46	35.40	9.50	0.32	41.45	54.00	-12.55	A	1.00

Measurement Distance at 1m Vertical polarity

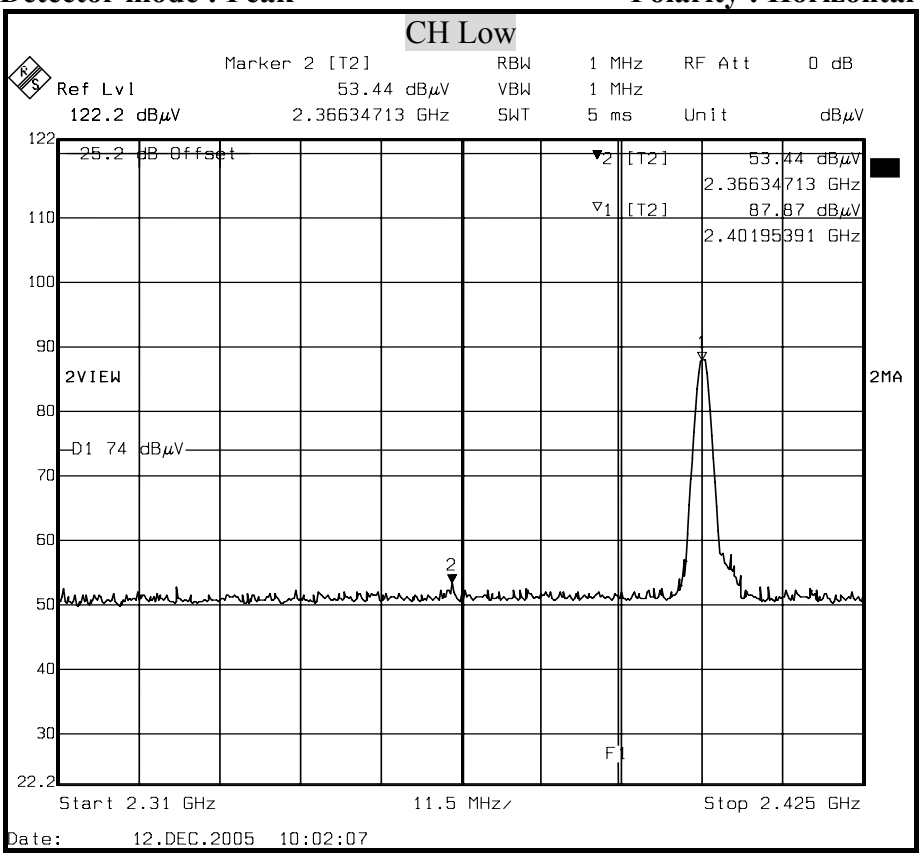
Freq. (MHz)	Reading (dBμV)	AF (dBμV)	Cable (dB)	Pre-amp (dB)	Dist (dB)	Filter (dB)	Level 1m (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Mark (P/Q/A)	Height (Meter)
4960.00	61.50	34.86	6.32	35.27	9.50	0.21	58.13	74.00	-15.87	P	1.00
4960.00	43.70	34.86	6.32	35.27	9.50	0.21	40.33	54.00	-13.67	A	1.00
7440.00	53.77	39.87	8.35	35.61	9.50	0.72	57.59	74.00	-16.41	P	1.00
7440.00	37.47	39.87	8.35	35.61	9.50	0.72	41.29	54.00	-12.71	A	1.00
12400.00	45.99	42.10	10.46	35.40	9.50	0.32	53.97	74.00	-20.03	P	1.00
12400.00	34.05	42.10	10.46	35.40	9.50	0.32	42.03	54.00	-11.97	A	1.00

Remark:

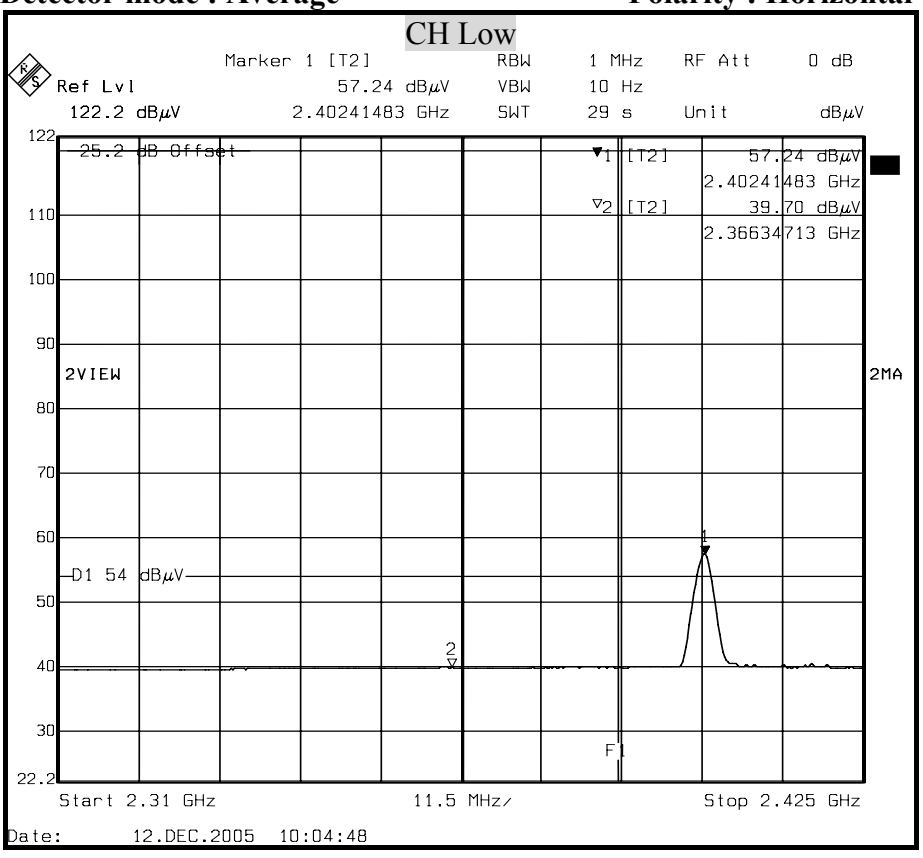
1. The measurement was searched to 10th harmonic.
2. AF: Antenna Factor, Cable: Cable Loss, Pre-Amp: Preamplifier gain, Filter: High Pass Filter Insertion Loss (3.5GHz)
3. Spectrum analyzer setting P(Peak): RBW=1MHz, VBW=1MHz, A(Average): RBW=1MHz, VBW=10Hz
4. Dist : correction to extra plate reading to 3m specification distance 1m measurement distance = -9.5dB
5. The result basic equation calculation is as follow:
Level = Reading + AF + Cable – Preamp + Filter – Dist, Margin = Level-Limit
6. The other emission levels were 20dB below the limit
7. The test limit distance is 3M limit.

8.8.4 RESTRICTED BAND EDGES

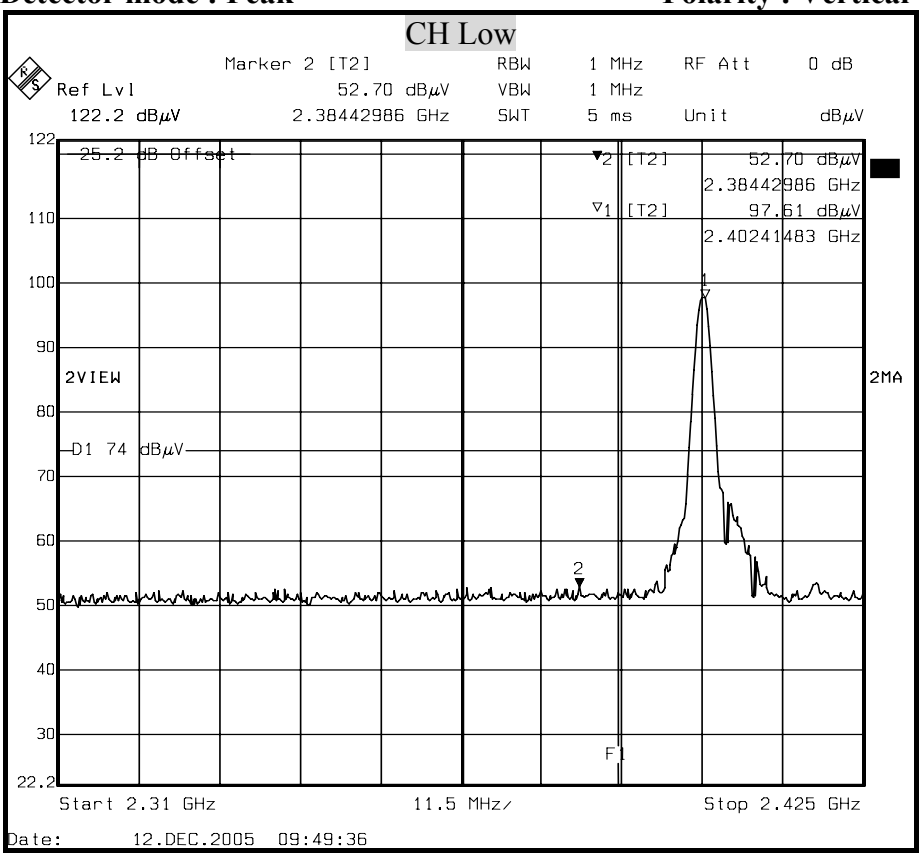
Detector mode : Peak **Polarity : Horizontal**



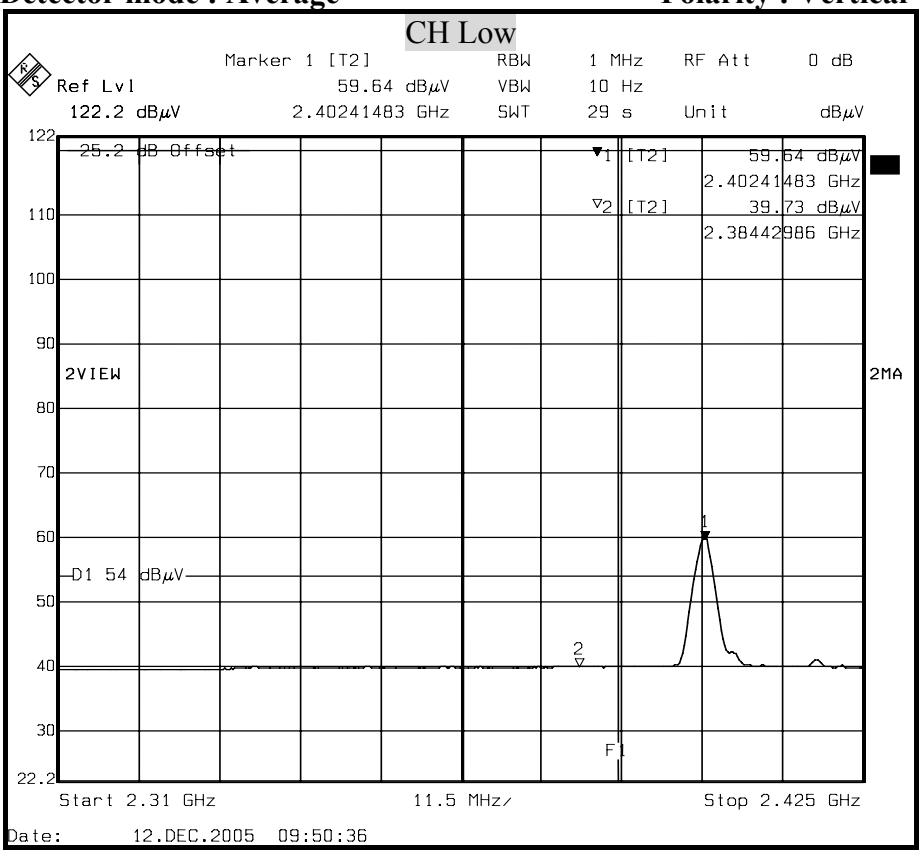
Detector mode : Average **Polarity : Horizontal**



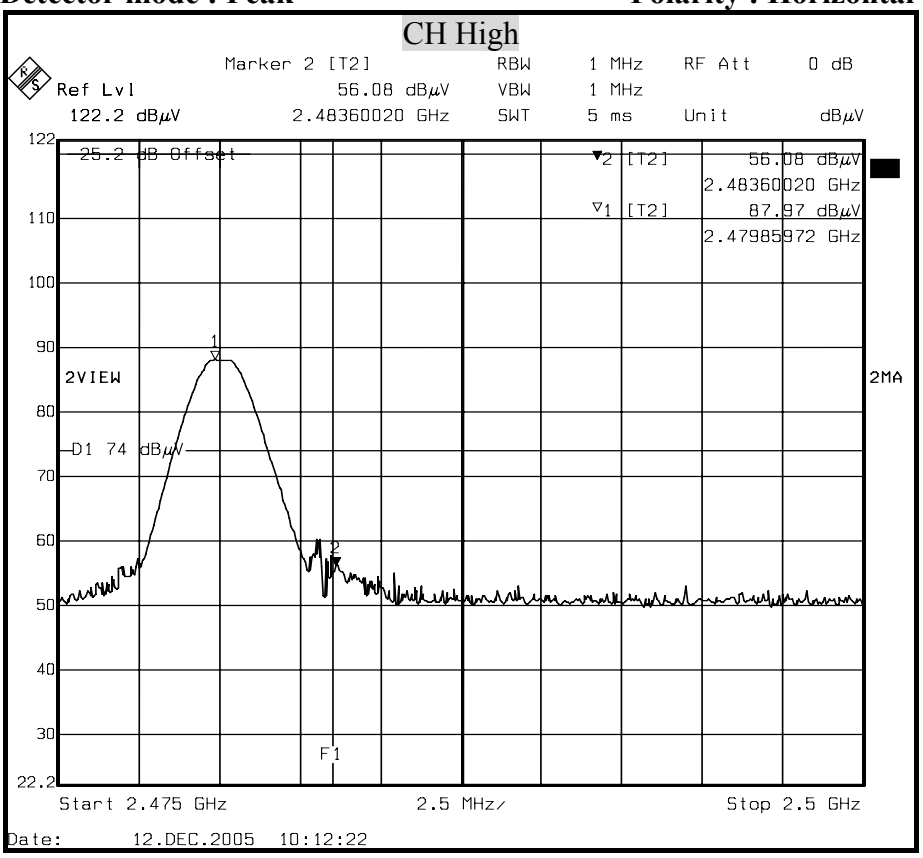
Detector mode : Peak **Polarity : Vertical**



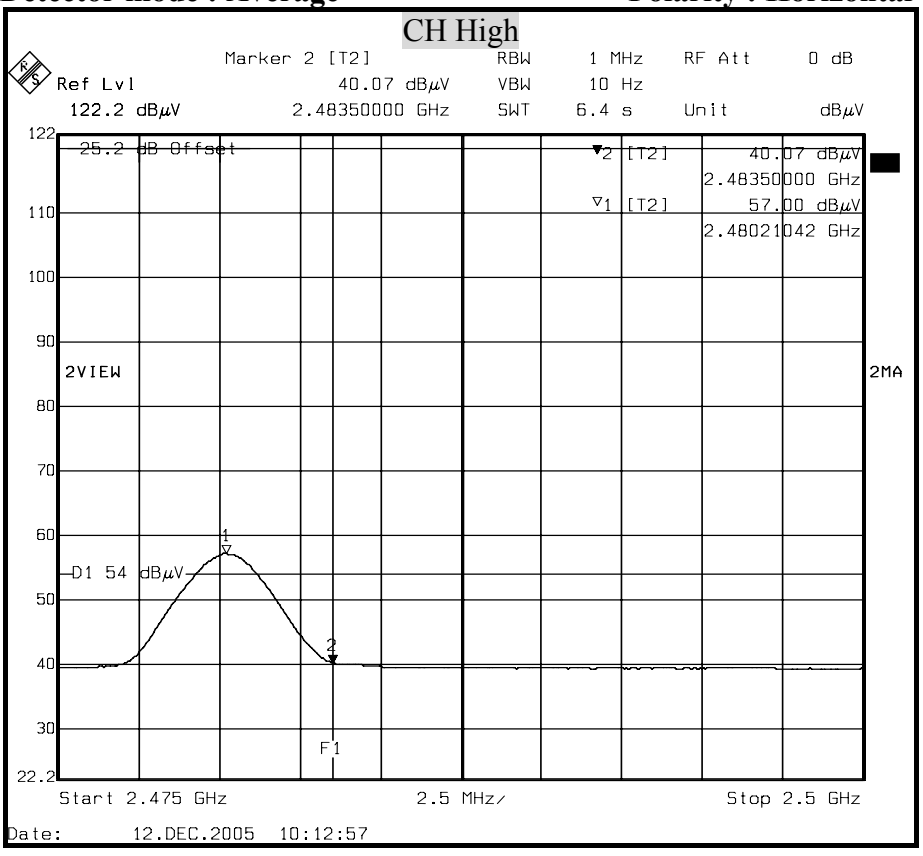
Detector mode : Average **Polarity : Vertical**



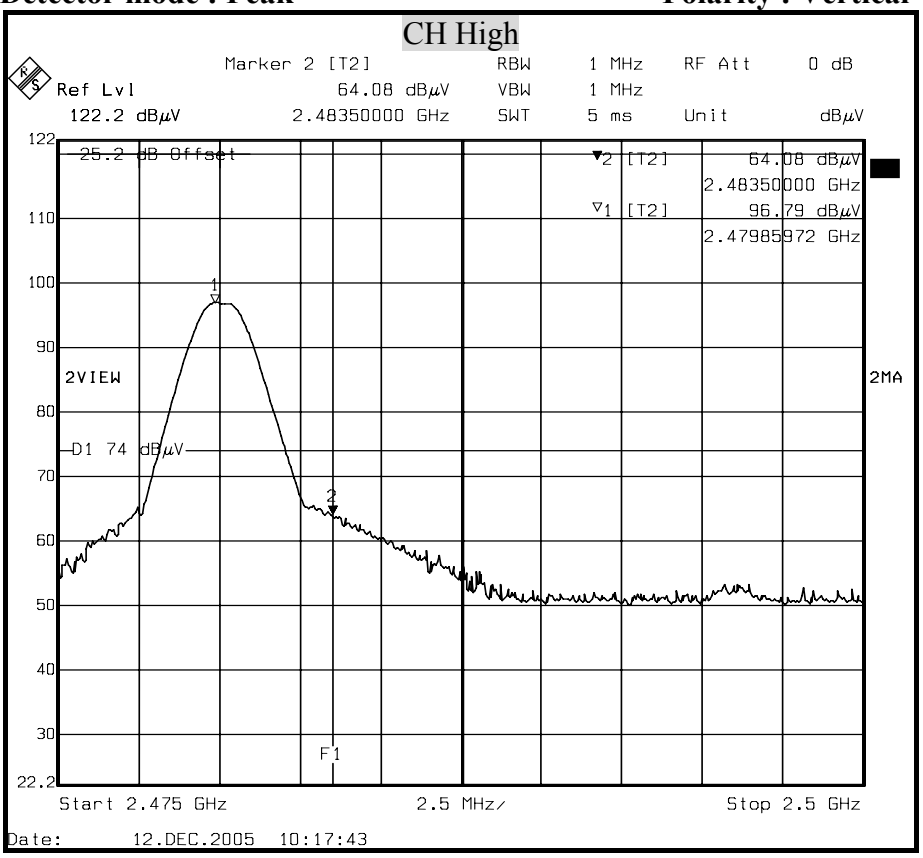
Detector mode : Peak **Polarity : Horizontal**



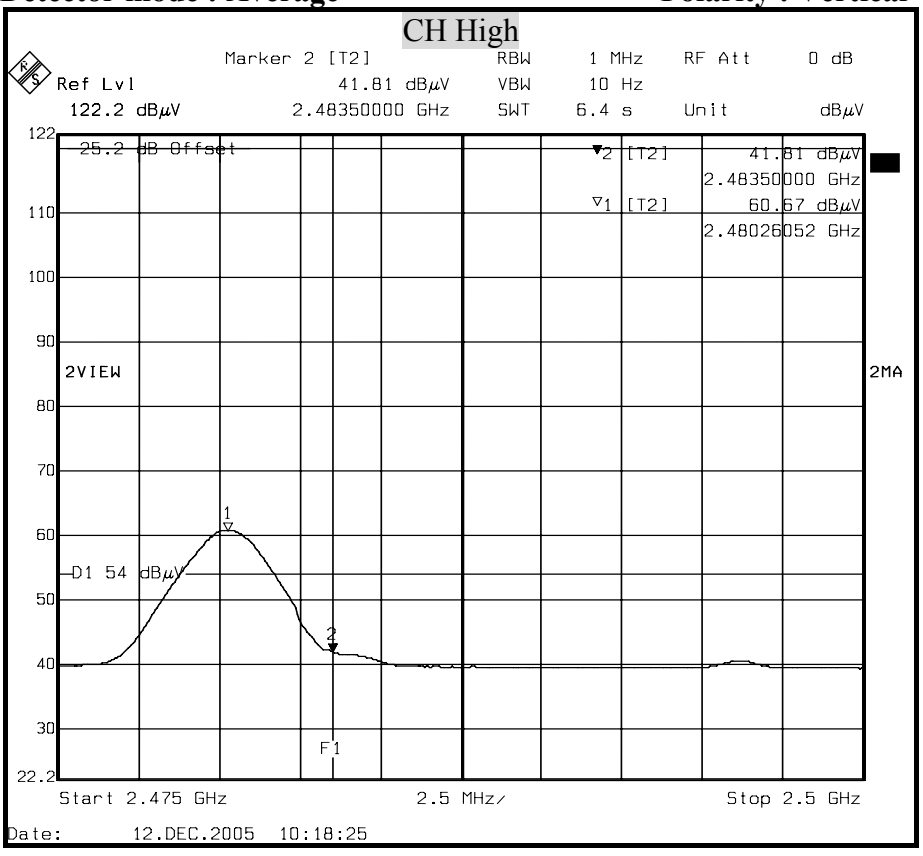
Detector mode : Average **Polarity : Horizontal**



Detector mode : Peak **Polarity : Vertical**



Detector mode : Average **Polarity : Vertical**



8.9 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.

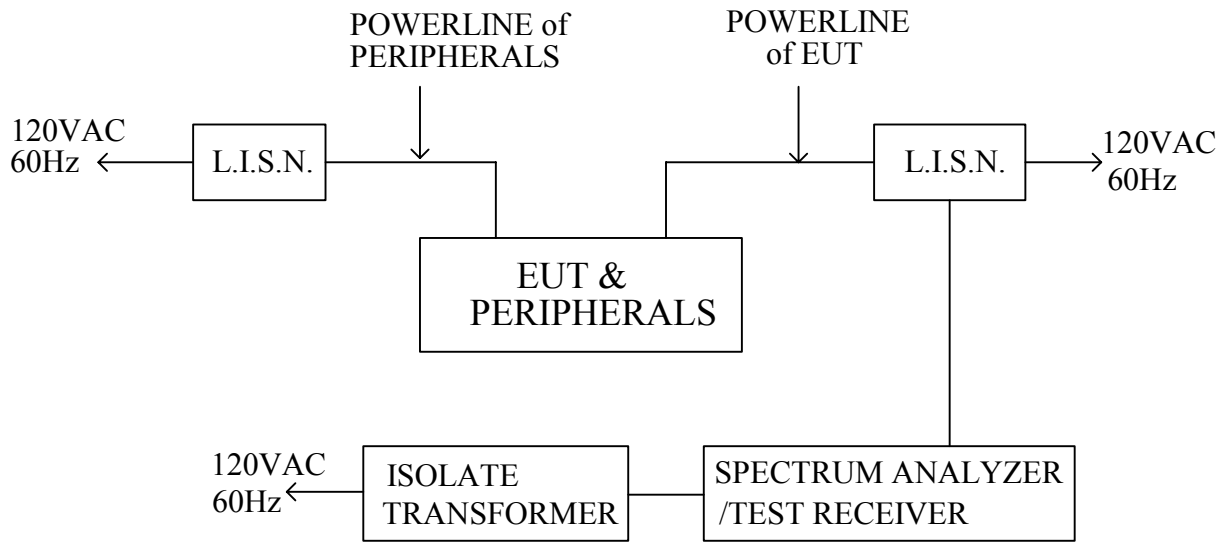
Frequency of Emission (MHz)	Conducted limit (dBμv)	
	Quasi-peak	Average
0.15 - 0.5	66 to 56	56 to 46
0.5 - 5	56	46
5 - 30	60	50

TEST EQUIPMENTS

The following test equipments are used during the conducted powerline tests：

Manufacturer or Type	Model No.	Serial No.	Date of Calibration	Calibration Period	Remark
HP SPECTRUM ANALYZER	8594E	3801A05627	April 28, 2005	1 Year	PRETEST
SOLAR ISOLATION TRANSFORMER	7032-1	N/A	N/A	N/A	FINAL
EMCO L.I.S.N.	3850/2	9311-1025 9401-1028	January 10, 2005 For Characteristic impedance January 10, 2005 For Insertion loss	1 Year	FINAL
R & S TEST RECEIVER	ESHS30	838550/003	February 21, 2005	1 Year	FINAL
KEENE SHIELDED ROOM	5983	No.1	N/A	N/A	FINAL
R & S PULSE LIMIT	EHS3Z2	357.8810.52	July 10, 2005	1 Year	FINAL
N TYPE COAXIAL CABLE	---------	----------	July 10, 2005	1 Year	FINAL
50Ω TERMINATOR	---------	----------	July 10, 2005	1 Year	FINAL

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.

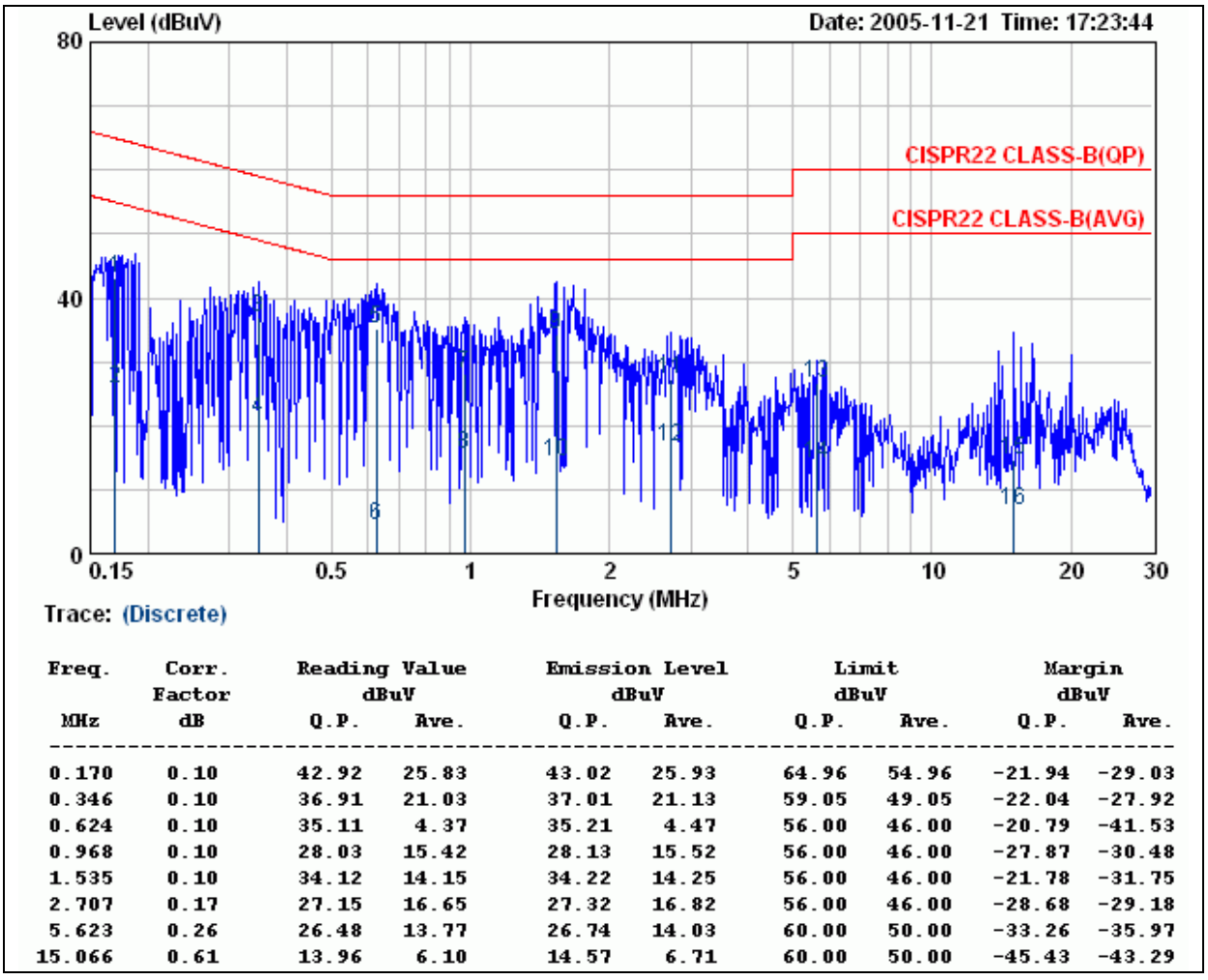
TEST RESULTS

No non-compliance noted

CONDUCTED RF VOLTAGE MEASUREMENT

Product Name	Bluetooth Audio Receiver	Test Date	2005/11/21
Model	GMHSBTAR	Test By	Nicky Liu
Test Mode	Normal operating	TEMP & Humidity	26.5°C, 55%

LINE



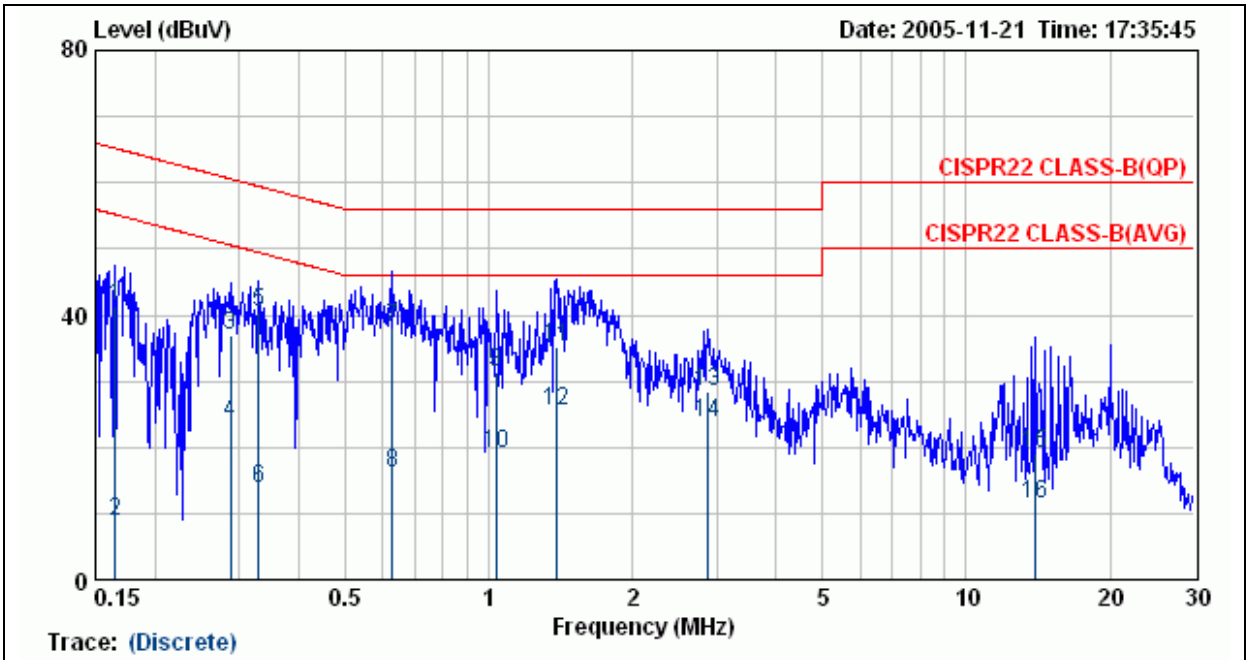
Freq.	Corr. Factor	Reading Value dBuV		Emission Level dBuV		Limit dBuV		Margin dBuV	
MHz	dB	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.
0.170	0.10	42.92	25.83	43.02	25.93	64.96	54.96	-21.94	-29.03
0.346	0.10	36.91	21.03	37.01	21.13	59.05	49.05	-22.04	-27.92
0.624	0.10	35.11	4.37	35.21	4.47	56.00	46.00	-20.79	-41.53
0.968	0.10	28.03	15.42	28.13	15.52	56.00	46.00	-27.87	-30.48
1.535	0.10	34.12	14.15	34.22	14.25	56.00	46.00	-21.78	-31.75
2.707	0.17	27.15	16.65	27.32	16.82	56.00	46.00	-28.68	-29.18
5.623	0.26	26.48	13.77	26.74	14.03	60.00	50.00	-33.26	-35.97
15.066	0.61	13.96	6.10	14.57	6.71	60.00	50.00	-45.43	-43.29

Remark:

1. *Correction Factor = Insertion loss + cable loss*
2. *Margin value = Emission level – Limit value*
3. *The EUT can be operated in transmitting, stand-by and receiving mode. After preliminary scan, EUT in transmitting mode has highest emission.*
   The EUT was set in transmitting mode at finial test to get the worst case test results.

Product Name	Bluetooth Audio Receiver	Test Date	2005/11/21
Model	GMHSBTAR	Test By	Nicky Liu
Test Mode	Normal operating	TEMP & Humidity	26.5°C, 55%

NEUTRAL



Freq.	Corr. Factor	Reading Value dBuV		Emission Level dBuV		Limit dBuV		Margin dBuV	
MHz	dB	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.	Q.P.	Ave.
0.165	0.20	41.19	8.67	41.39	8.87	65.21	55.21	-23.82	-46.34
0.288	0.20	36.81	23.56	37.01	23.76	60.59	50.59	-23.58	-26.83
0.330	0.20	40.16	13.59	40.36	13.79	59.44	49.44	-19.08	-35.65
0.627	0.20	37.78	16.00	37.98	16.20	56.00	46.00	-18.02	-29.80
1.037	0.20	31.30	18.71	31.50	18.91	56.00	46.00	-24.50	-27.09
1.388	0.20	35.04	25.35	35.24	25.55	56.00	46.00	-20.76	-20.45
2.884	0.20	28.32	23.62	28.52	23.82	56.00	46.00	-27.48	-22.18
13.915	0.59	18.52	10.87	19.11	11.46	60.00	50.00	-40.89	-38.54

Remark:

1. Correction Factor = Insertion loss + cable loss
2. Margin value = Emission level – Limit value
3. The EUT can be operated in transmitting, stand-by and receiving mode. After preliminary scan, EUT in transmitting mode has highest emission.
The EUT was set in transmitting mode at finial test to get the worst case test results.

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 in this product is Dipole antenna. The maximum Gain of the antenna only 1.2dBi.