FCC 15.247

EMI MEASUREMENT AND TEST REPORT

For

Chongqing JINOU Science and Technology Development Co., Ltd.

Room 208 Chuangyeyuan, 202# Keyuan 3rd Rd., 106# Hi-Tech Development Zone
Chongqing, China 400039

FCC ID: SI88261

This Report Concerns:	**Equipment Type:**
☒ Original Report	Bluetooth Dongle with Flash Disk

Test Engineer:	Snell Leong
Report No.:	R0409149
Test Date:	2004-10-19
Reviewed By:	Daniel Deng /
Prepared By:	Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

TABLE OF CONTENTS

GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *Chongqing JINOU Science and Technology Development Co., Ltd.'s* product, model no.: *JINOU8261* or the "EUT" as referred to this report is a Bluetooth USB Flash Disk which measures approximately 83mmL x 22mmW x 7mmH. The EUT operates at the frequency range of 2402 – 2480MHz, with maximum output power of 0.0013W.

** The test data gathered are from typical production sample, serial number: DJ0030267, provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *Chongqing JINOU Science and Technology Development Co., Ltd.* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, C.

The objective is to determine compliance with FCC 15.247 rules for the bluetooth:

- Maximum Peak Output Power
- Hopping Channel Separation
- Number of Hopping Frequency Used
- 20 dB Bandwidth
- Dwell Time on Each Channel
- 100 kHz Bandwidth of Band Edge
- Conducted Emission
- Spurious Emission
- Radiated Emission
- Antenna Requirement

Related Submittal(s)/Grant(s)

No Related Submittals

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2001& TIA/EIA-603.

Test Facility

The Open Area Test site used by BACL Corp. to collect radiated and conducted emission measurement data is located in the back parking lot of the building at 230 Commercial Street, Sunnyvale, California, USA.

Test site at BACL Corp. has been fully described in reports submitted to the Federal Communication Commission (FCC) and Voluntary Control Council for Interference (VCCI). The details of these reports has been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on February 11 and December 10, 1997 and Article 8 of the VCCI regulations on December 25, 1997. The facility also complies with the test methods and procedures set forth in ANSI C63.4-2001& TIA/EIA-603.

The Federal Communications Commission and Voluntary Control Council for Interference has the reports on file and is listed under FCC file 31040/SIT 1300F2 and VCCI Registration No.: C-1298 and R-1234. The test site has been approved by the FCC and VCCI for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, BACL is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200167-0). The scope of the accreditation covers the FCC Method - 47 CFR Part 15 - Digital Devices, CISPR 22:2002,Electromagnetic Interference - Limits and Methods of Measurement of Information Technology Equipment test methods.

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2001 & TIA/EIA-603.

The final qualification test was performed with the EUT operating at normal mode.

Block Diagram

Please refer to Exhibit D.

Equipment Modifications

No modifications were made to the EUT.

Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
SONY	Notebook PC	PCG-885L	283520304516747	DOC

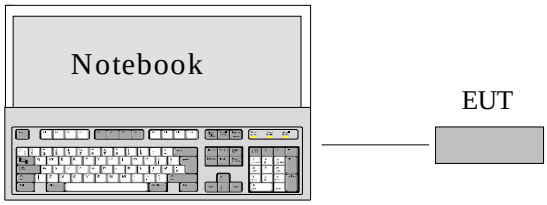
Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
SONY	AC Adapter	PCGA-AC16V	0111A0217169P	DOC

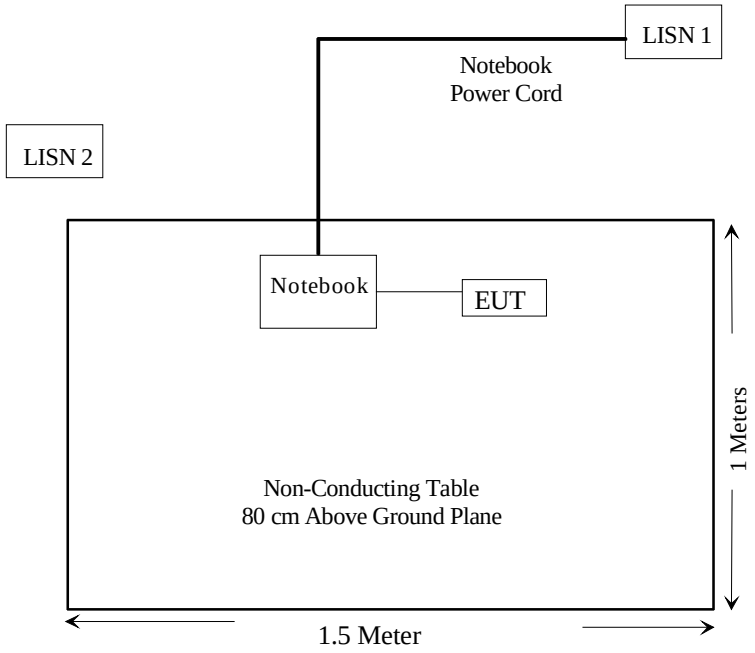
Interface Ports and Cabling

Cable Description	Length (M)	From	To
USB Extension Cable	1.5	USB port/Notebook PC	EUT

Configuration of Test System



Test Setup Block Diagram



SUMMARY OF TEST RESULTS FOR FCC PART 15

FCC RULES	DESCRIPTION OF TEST	RESULT
§15.203	Antenna Requirement	Compliant
§ 15.205	Restricted Bands	N/A
§15.207 (a)	Conducted Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.247 (a) (1)	Hopping Channel Separation	Compliant
§15.247 (a) (1)	Channel Bandwidth	Compliant
§15.247 (a) (1) (iii)	Number of Hopping Frequencies Used	Compliant
§15.247 (a) (1) (iii)	Dwell Time of Each Frequency within a 10 Second Period of time (0.4 x Number of Channel)	Compliant
§15.247 (b) (1)	Maximum Peak Output Power	Compliant
§ 15.247 (b)(4) § 2.1093	RF Safety Requirements	Compliant
§ 15.247 (c)	100 kHz Bandwidth of Frequency Band Edge	Compliant
	Spurious Emission at Antenna Port	Compliant

§1.1307(b)(1) & §2.1093 - RF EXPOSURE

According to §15.247(b)(4) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1093 RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

f = frequency in MHz
* = Plane-wave equivalent power density

MPE Prediction

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$S = PG/4\pi R^2$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

2402 – 2480 MHz:
Maximum peak output power at antenna input terminal: 1.21(dBm)
Maximum peak output power at antenna input terminal: 1.32 (mW)
Predication frequency: 2400 (MHz)
Antenna Gain (typical): 0 (dBi)
antenna gain: 1 (numeric)
Prediction distance: 2.5 (cm)
Power density at predication frequency at 2.5 cm: 0.017(mW/cm^2)

MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm^2)

Test Result

The EUT is a portable device. Power density level at prediction distance 2.5cm is 0.017, which is below the uncontrolled limit of 1.0mW/cm^2.

ANTENNA REQUIREMENT

According to § 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 § 15.247 (1), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

The gain of antenna used for transmitting is 0 dBi by default, and the antenna connector is designed with permanent attachment and no consideration of replacement.

§15.207(a) - CONDUCTED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, and LISN.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of any conducted emissions measurement at BACL is ±2.4 dB.

Test Setup

The measurement was performed at shield room, using the same setup per ANSI C63.4 – 2001 measurement procedure. The specification used was FCC Class B limits.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The Notebook PC was connected with LISN-1.

Spectrum Analyzer Setup

The spectrum analyzer was set to investigate the spectrum from 150 kHz to 30MHz.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Date
Rohde & Schwarz	LISN	ESH2-Z5	871884/039	2004-03-28
Rohde & Schwarz	EMI Test Receiver	ESCS30	100176	2004-05-06
Fluke	Calibrated Voltmeter	189	18485-38	2004-07-18

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Test Procedure

During the conducted emission test, the power cord of the host system was connected to the mains outlet of the LISN-1.

Maximizing procedure were performed on the six (6) highest emissions of the EUT.

All data was recorded in the peak detection mode, quasi-peak and average. Qusi-Peak readings are distinguished with an “QP”. Average readings are distinguished with an “Ave”.

Environmental Conditions

Temperature:	25° C
Relative Humidity:	32%
ATM Pressure:	1018 mbar

The testing was performed by Snell Leong on 2004-10-04.

Summary of Test Results

According to the recorded data in following table, the EUT complied with the FCC Conducted limit for a Class B device, with the *worst* margin reading of:

-4.6 dB at **0.220 MHz** in the **Neutral** conductor

Conducted Emissions Test Data

LINE CONDUCTED EMISSIONS				FCC CLASS B	
Frequency MHz	Amplitude dBμV	Detector Qp/Ave/Peak	Phase Line/Neutral	Limit dBμV	Margin dB
0.220	48.2	Ave	Neutral	52.82	-4.6
0.235	45.6	Ave	Line	52.27	-6.7
0.220	52.0	QP	Neutral	62.82	-10.8
1.080	35.0	Ave	Line	46.00	-11.0
1.000	34.1	Ave	Neutral	46.00	-11.9
0.235	50.2	QP	Line	62.27	-12.1
0.445	34.6	Ave	Neutral	46.97	-12.4
0.840	32.9	Ave	Line	46.00	-13.1
3.270	39.4	QP	Neutral	56.00	-16.6
1.080	39.3	QP	Line	56.00	-16.7
0.840	39.0	QP	Line	56.00	-17.0
1.000	38.6	QP	Neutral	56.00	-17.4

Plot of Conducted Emissions Test Data

Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.

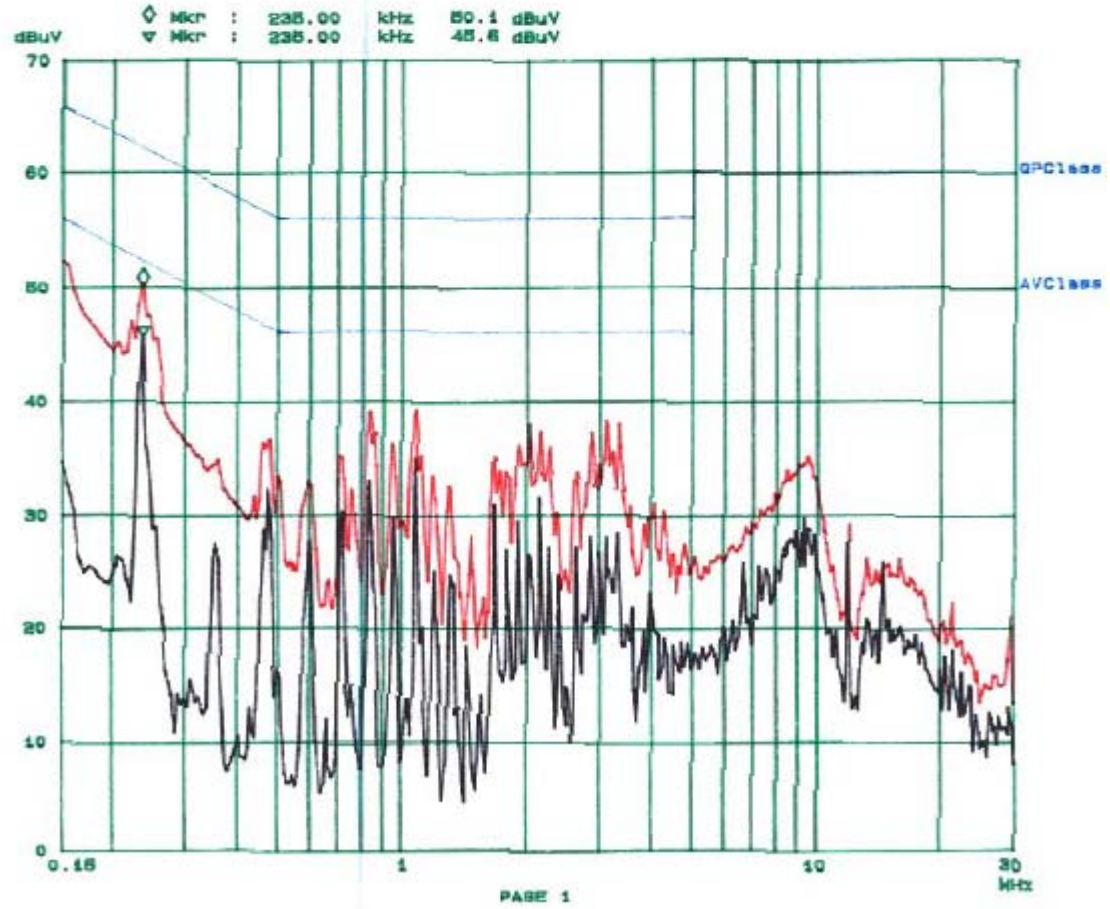
Snell

Bay Area Compliance Laboratory Corp 14. Oct 04 10:07
Class B

EUT: USB Flash Drive & Blue Tooth
Manuf: ChongQing Jihou
Op Cond: Normal
Operator: Snell
Comment: L
File name: ClassB.SPC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	15dBLN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dBLN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dBLN	OFF



PAGE 1

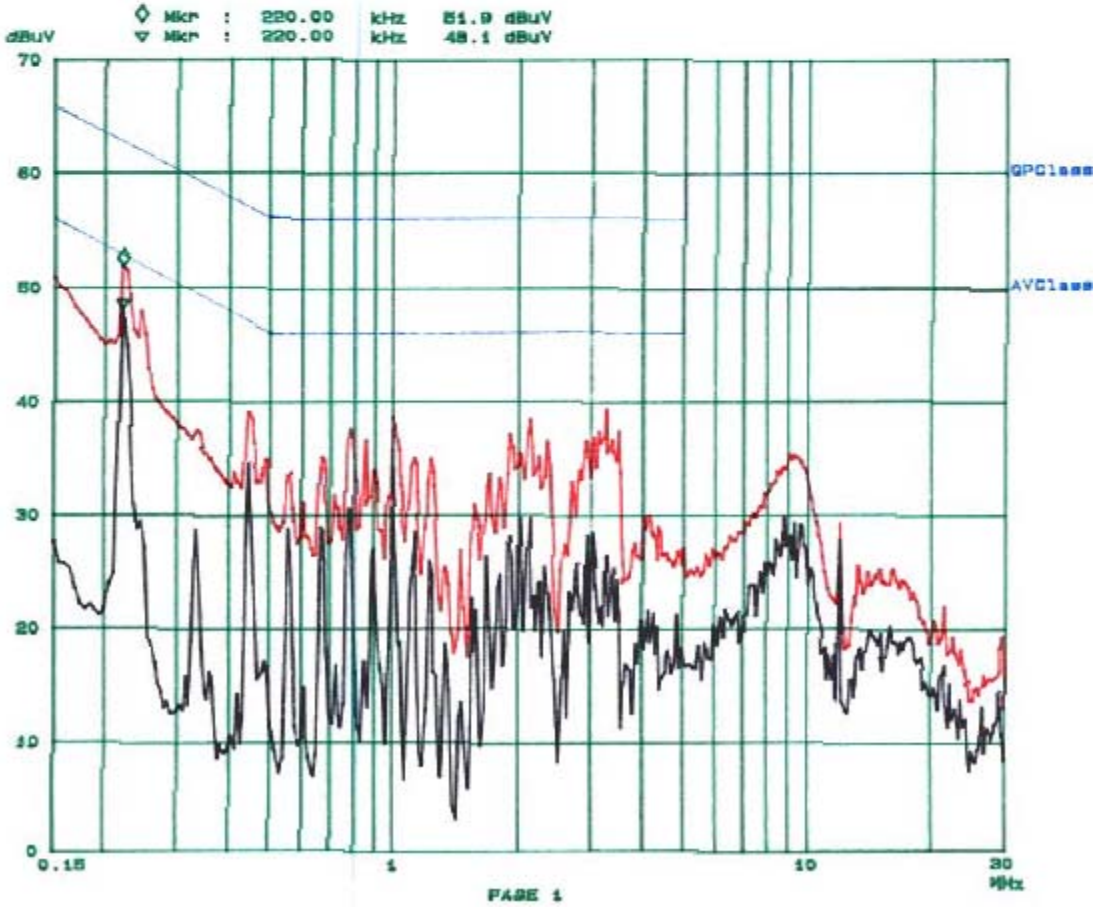
Shell

Bay Area Compliance Laboratory Corp 14. Oct 04 08:38
Class B

EUT:	USB Flash Drive & Blue Tooth
Manuf:	ChongQing Jinou
Op Cond:	Normal
Operator:	Shell
Comment:	N
File name:	ClassB.SPC

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	5k	9k	QP+AV	20ms	15dBLN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dBLN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dBLN	OFF



§15.205 & §15.209 - RADIATED EMISSION

Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Based on NIS 81, The Treatment of Uncertainty in EMC Measurements, the best estimate of the uncertainty of a radiation emissions measurement at BACL is $\pm$4.0 dB.

Test Setup

The radiated emission tests were performed in the open area 3-meter test site, using the setup in accordance with ANSI C63.4-2001. The specification used was the FCC 15 Subpart C limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

The notebook PC was connected with 120Vac/60Hz power source.

Spectrum Analyzer Setup

According to FCC Rules, 47 CFR §15.33 (a) (1), the system was tested to 25GHz.

During the radiated emission test, the spectrum analyzer was set with the following configurations:

Frequency Range	***RBW***	***Video B/W***
Below 30MHz	10kHz	10kHz
30 – 1000MHz	100kHz	100kHz
Above 1000MHz	1MHz	1MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Cal. Due Date
HP	Amplifier, Pre, microwave	8449B	3147A00400	2004-03-14
HP	Amplifier, Pre	8447E	1937A01057	2004-08-04
HP	Analyzer, Spectrum	8565EC	3946A00131	2004-06-30
ETS	Antenna, Biconical	3110B	9603-2315	2004-01-11
A.R.A.	Antenna, Horn, DRG	DRG-118/A	1132	2004-09-30
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	2455-261	2004-08-01
ETS	Antenna, logperiodic	3148	0004-1155	2003-10-11

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

The testing was performed by Snell Leong on 2004-10-04.

Test Procedure

For the radiated emissions test, both the laptop and all peripheral power cords were connected to the AC floor outlet since the power supply used in the laptop did not provide an accessory power outlet.

Maximizing procedure was performed on the six (6) highest emissions to ensure EUT compliance is with all installation combinations.

All data was recorded in the peak detection mode. Quasi-peak readings was performed only when an emission was found to be marginal (within -4 dB of specification limits), and are distinguished with a "**Qp**" in the data table.

Corrected Amplitude & Margin Calculation

The Corrected Amplitude is calculated by adding the Antenna Factor and Cable Factor, and subtracting the Amplifier Gain from the Amplitude reading. The basic equation is as follows:

Corr. Ampl. = Indicated Reading + Antenna Factor + Cable Factor - Amplifier Gain

The "**Margin**" column of the following data tables indicates the degree of compliance with the applicable limit. For example, a margin of -7dB means the emission is 7dB below the maximum limit for Class B. The equation for margin calculation is as follows:

Margin = Corr. Ampl. - Class B Limit

Summary of Test Results

According to the recorded data in following table, the EUT measured –0.8 dB margin, with the measurement uncertainty of $\pm$ 2.4 dB, and had the worst margin of:

Transmitter:

-0.8 dB at **7203.60 MHz** in the **Vertical** polarization, Low Channel.

-3.4 dB at **4880.26 MHz** in the **Vertical** polarization, Middle Channel.

-6.2 dB at **4958.24 MHz** in the **Vertical** polarization, High Channel.

-4.3 dB at **976.00MHz** in the **Vertical** polarization, Unintentional Emission.

Receiver:

-1.1 dB at **940.1 MHz** in the **Vertical** polarization

Transmitter Radiated Emission Test Data

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C		
Frequency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Comments
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB	
Low Channel											
7203.60	44.40	15	1.1	V	36.3	6.0	33.5	53.2	54	-0.8	AVG
4802.40	49.60	15	1.2	V	32.5	4.9	34.8	52.2	54	-1.8	AVG
7203.60	40.50	345	1.6	H	36.3	6.0	33.5	49.3	54	-4.7	AVG
2401.20	92.50	350	3.0	V	28.1	3.4	35.1	88.9	94	-5.1	PEAK
4802.40	44.30	250	2.0	H	32.5	4.9	34.8	46.9	54	-7.1	AVG
7203.60	54.30	15	1.1	V	36.3	6.0	33.5	63.1	74	-10.9	PEAK
4802.40	58.40	15	1.2	V	32.5	4.9	34.8	61.0	74	-13.0	PEAK
2401.20	83.30	330	1.7	H	28.1	3.4	35.1	79.7	94	-14.3	PEAK
7203.60	48.40	345	1.6	H	36.3	6.0	33.5	57.2	74	-16.8	PEAK
4802.40	54.40	250	2.0	H	32.5	4.9	34.8	57.0	74	-17.0	PEAK
2401.20	97.00	350	3.0	V	28.1	3.4	35.1	93.4	114	-20.6	PEAK
2401.20	94.90	330	1.7	H	28.1	3.4	35.1	91.3	114	-22.7	PEAK
Middle Channel											
4880.26	48.00	15	1.2	V	32.5	4.9	34.8	50.6	54	-3.4	AVG
4880.26	47.60	250	2.0	H	32.5	4.9	34.8	50.2	54	-3.8	AVG
2440.13	86.80	90	1.6	V	28.1	3.4	35.1	83.2	94	-10.8	AVG
2440.13	85.00	80	2.0	H	28.1	3.4	35.1	81.4	94	-12.6	AVG
1449.20	65.30	180	1.8	V	28.1	3.4	36.3	60.5	74	-13.5	Peak
1850.30	64.70	180	1.6	V	28.1	3.4	36.3	59.9	74	-14.1	Peak
4880.26	57.10	250	2.0	H	32.5	4.9	34.8	59.7	74	-14.3	Peak
1320.30	62.83	180	1.5	V	28.1	3.4	36.3	58.0	74	-16.0	Peak
4880.26	55.20	15	1.2	V	32.5	4.9	34.8	57.8	74	-16.2	Peak
1198.70	62.30	220	1.8	V	28.1	3.4	36.3	57.5	74	-16.5	Peak
2440.13	99.90	90	1.6	V	28.1	3.4	35.1	96.3	114	-17.7	Peak
1978.20	61.10	180	1.4	V	28.1	3.4	36.3	56.3	74	-17.7	Peak
2440.13	97.60	80	2.0	H	28.1	3.4	35.1	94.0	114	-20.0	Peak
High Channel											
4958.24	45.20	15	1.2	V	32.5	4.9	34.8	47.8	54	-6.2	AVG
1188.50	66.10	350	1.6	H	28.1	3.4	33.5	64.1	74	-10.0	Peak
2479.12	86.60	130	2.0	H	28.1	3.4	35.1	83.0	94	-11.0	AVE
1457.00	64.70	30	1.6	H	28.1	3.4	33.5	62.7	74	-11.4	Peak
2479.12	86.00	170	1.6	V	28.1	3.4	35.1	82.4	94	-11.6	AVE
4958.24	54.60	15	1.2	V	32.5	4.9	34.8	57.2	74	-16.8	Peak
1063.70	59.10	0	1.8	V	28.1	3.4	33.5	57.1	74	-17.0	Peak
1320.00	58.90	340	1.1	V	28.1	3.4	33.5	56.9	74	-17.2	Peak
2479.12	99.00	130	2.0	H	28.1	3.4	35.1	95.4	114	-18.6	Peak.
2479.12	97.50	170	1.6	V	28.1	3.4	35.1	93.9	114	-20.1	Peak.

Note:

FUND: Fundamental
AVG: Average

Unintentional Emission

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C	
Frequency MHz	Ampl. dBμV/m	Direction Degree	Height Meter	Polar H/V	Antenna dBμV/m	Cable Loss dBμV/m	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB
976.00	48.10	345	1.7	V	23.7	4.2	28.0	48.0	54	-4.3
396.20	27.50	350	3.0	V	16.0	2.5	28.3	17.7	46	-8.9
189.00	29.20	15	1.2	V	13.7	2.1	28.4	16.6	43.5	-20.7
141.50	25.10	35	1.5	V	12.4	1.6	28.5	10.6	43.5	-20.7
345.00	52.30	345	1.7	H	15.5	2.3	28.5	41.6	46	-23.6
260.00	51.00	350	2.6	V	13.4	2.2	28.0	38.6	46	-28.3

Receiver Radiated Emission Test Data

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C		
Frequency MHz	Ampl. dBμV/m	Direction Degree	Height Meter	Polar H/V	Antenna dBμV/m	Cable Loss dBμV/m	Amp. dB	Corr. Ampl. dBμV/m	Limit dBμV/m	Margin dB	Comments
Low Channel											
940.10	42.27	15	1.6	V	32.5	4.9	34.8	44.9	46	-1.1	PEAK
814.30	41.96	330	1.7	H	28.1	3.4	35.1	38.3	46	-7.7	PEAK
1942.00	45.86	280	1.7	H	28.1	3.4	35.1	42.2	54	-11.8	PEAK
982.40	38.61	180	2.5	H	28.1	3.4	35.1	35.0	54	-19.0	PEAK
1918.00	27.00	200	2.0	H	32.5	4.9	34.8	29.6	54	-24.4	PEAK

§15.247 (a) (1) - HOPPING CHANNEL SEPARATION

Standard Applicable

According to §15.247(a)(1), frequency hopping system shall have, hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater. The system shall hop to channel frequencies that are selected at the system hopping rate from a pseudorandomly ordered list of hopping frequencies.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on a bench 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 Max-Hold function record the separation of two adjacent channels.
4. Measure the frequency difference of these two adjacent channels by SA MARK function, and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Model No.	Description	Serial Number	Calibration Date
Agilent	E4448A	Spectrum Analyzer	1030645	2004-08-20

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

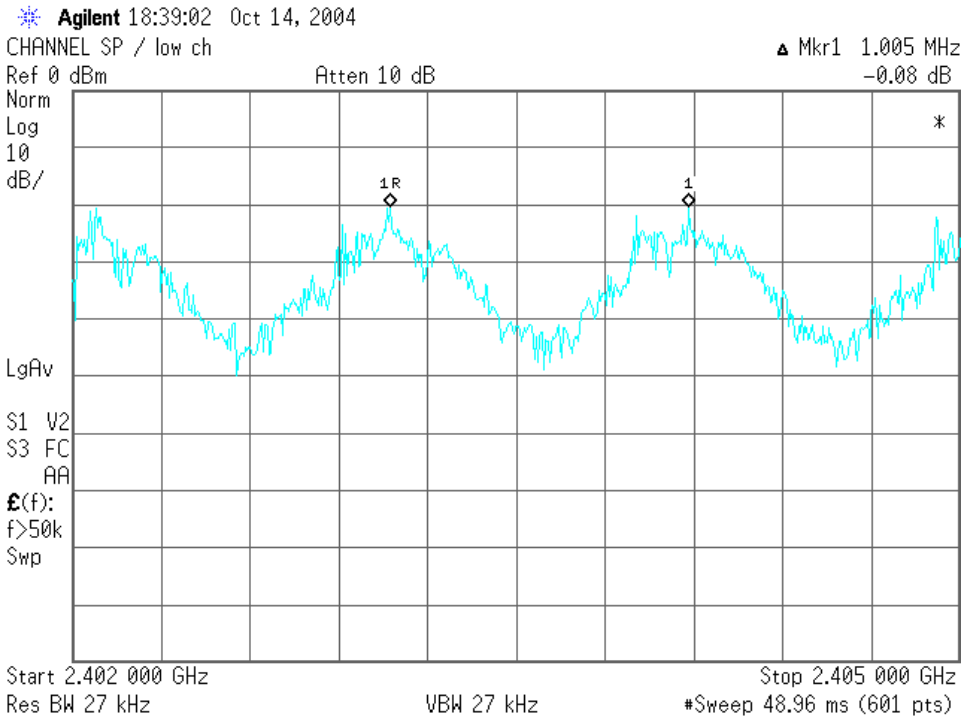
The testing was performed by Snell Leong on 2004-10-04.

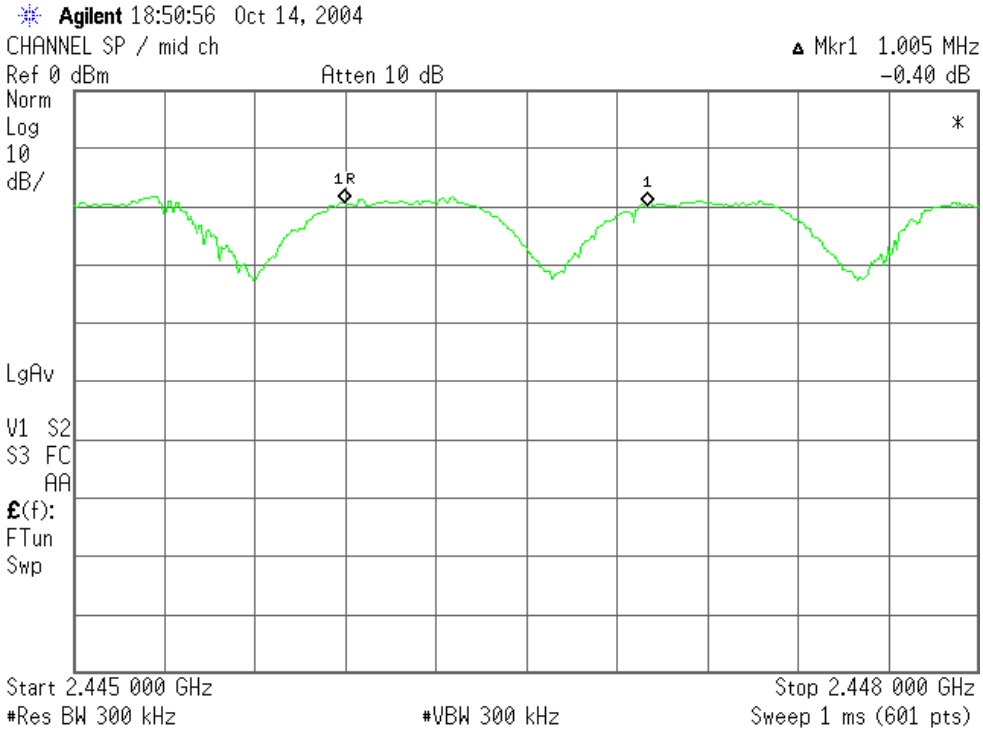
Measurement Results

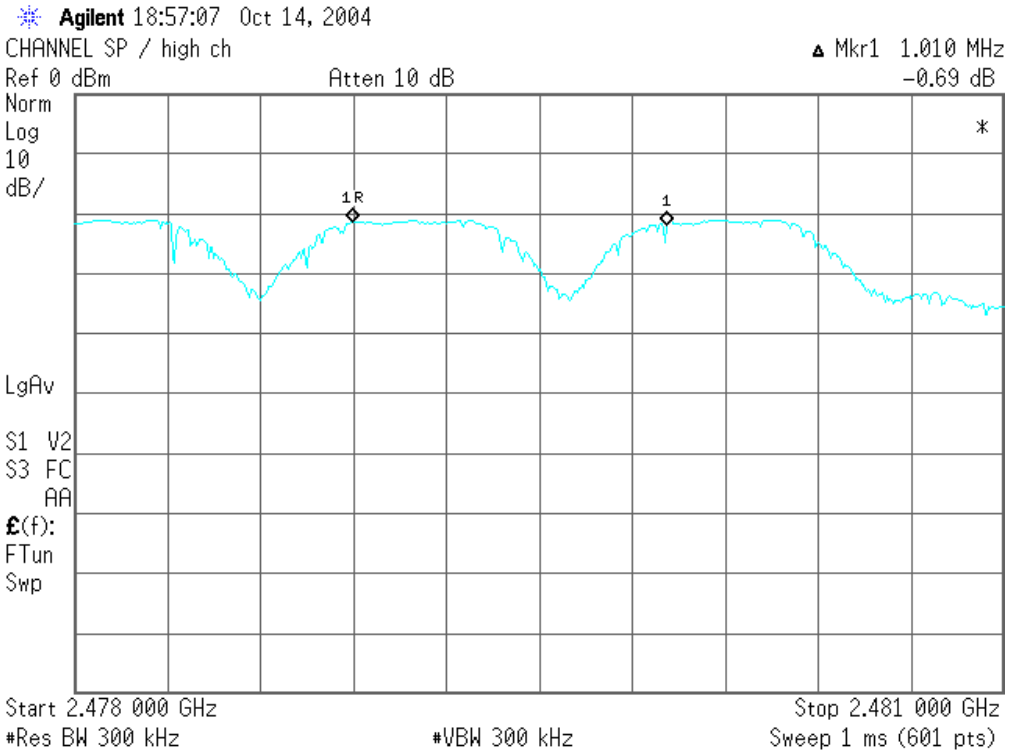
Channel	Frequency MHz	Channel Separation
Low	2402	1.005 MHz
Mid	2441	1.005 MHz
High	2480	1.005 MHz

Plots of Hopping Channel Separation

Please refer to the following plots.






Agilent 18:57:07 Oct 14, 2004
CHANNEL SP / high ch
Mkr1 1.010 MHz
Ref 0 dBm
Atten 10 dB
-0.69 dB
Norm
Log
10
dB/
1R
1
LgAv
S1 V2
S3 FC
AA
£(f):
FTun
Swp
Start 2.478 000 GHz
Stop 2.481 000 GHz
#Res BW 300 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)

§15.247 (a) (1) - CHANNEL BANDWIDTH

Standard Applicable

According to §15.247(a)(l), frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.

Measurement 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 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. Set a reference level on the measuring instrument equal to the highest peak value.
3. Measure the frequency difference of two frequencies that were attenuated 20 dB from the reference level. Record the frequency difference as the emission bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Model No.	Description	Serial Number	Calibration Date
Agilent	E4448A	Spectrum Analyzer	1030645	2004-08-20

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

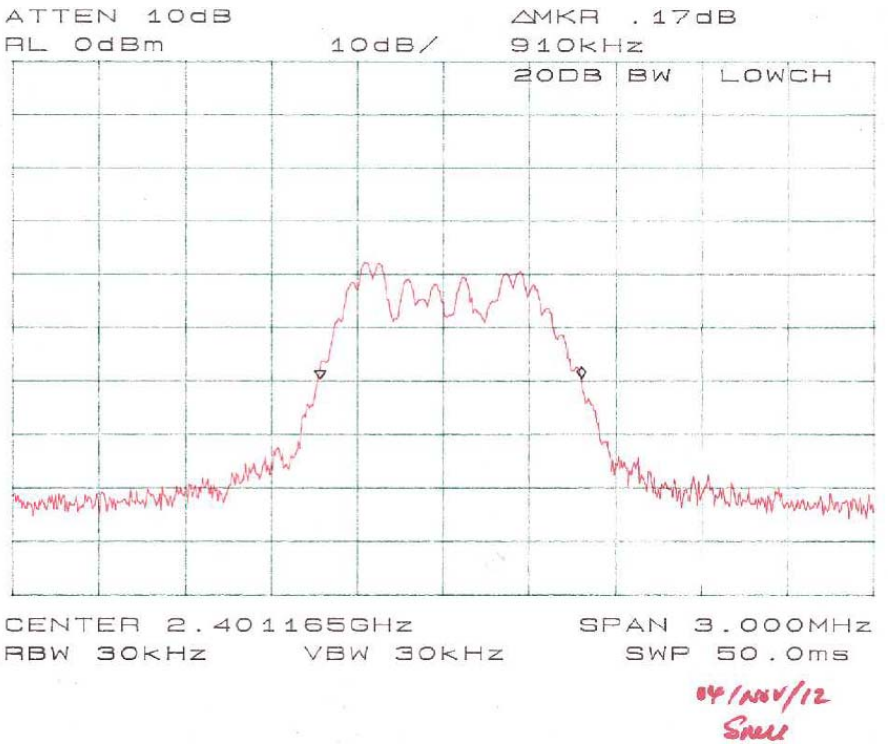
The testing was performed by Snell Leong on 2004-10-04.

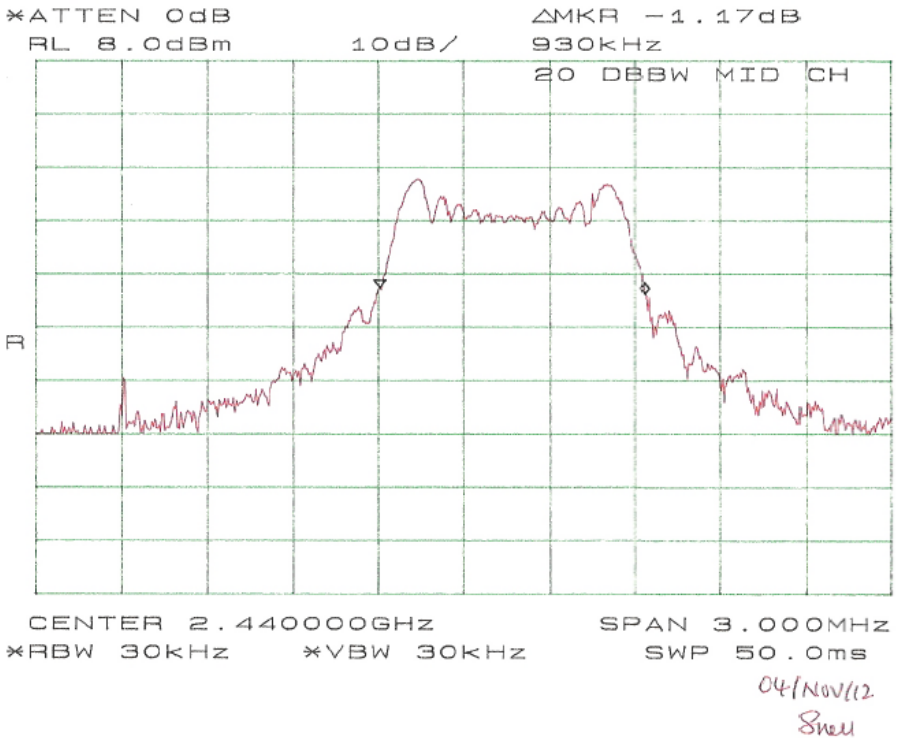
Measurement Result

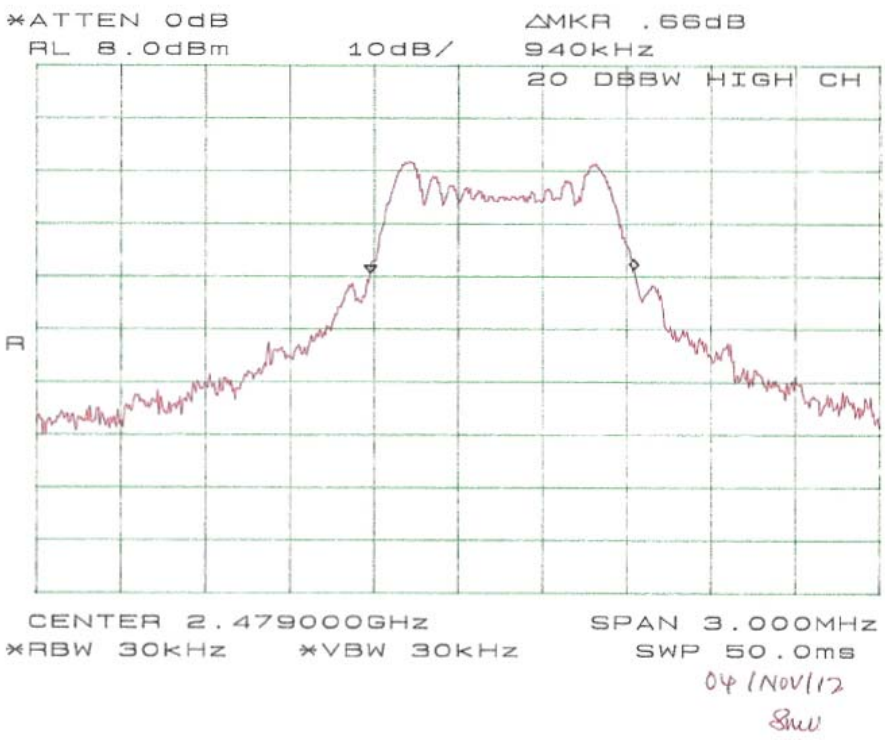
Channel	Frequency	Measurement (kHz)	Standard	Result
Low	2401	910	≤ 1MHz	Compliant
Mid	2440	930	≤ 1MHz	Compliant
High	2479	940	≤ 1MHz	Compliant

Plot of Channel Bandwidth

Please see the following plots


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR .17dB
910kHz
20DB BW LOWCH
CENTER 2.401165GHz
SPAN 3.000MHz
RBW 30kHz
VBW 30kHz
SWP 50.0ms
04/NOV/12
Shell


*ATTEN 0dB
RL 8.0dBm
10dB/
ΔMKR −1.17dB
930kHz
20 DBBW MID CH
R
CENTER 2.440000GHz
SPAN 3.000MHz
*RBW 30kHz
*VBW 30kHz
SWP 50.0ms
04/NOV/12
Shell


*ATTEN 0dB
RL 8.0dBm
10dB/
ΔMKR .66dB
940kHz
20 DBBW HIGH CH
R
CENTER 2.479000GHz
SPAN 3.000MHz
*RBW 30kHz
*VBW 30kHz
SWP 50.0ms
04 NOV 12

§15.247 (a) (1) (iii) - NUMBER OF HOPPING FREQUENCY USED

Standard Applicable

According to §15.247(a)(1)(iii), frequency hopping systems operating in the 2400-2483.5Mhz band shall use at least 75 hopping frequencies.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Position the EUT on the bench 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 SA on Max-Hold 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 SA on View mode and then plot the result on SA screen.
5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Model No.	Description	Serial Number	Calibration Date
Agilent	E4448A	Spectrum Analyzer	1030645	2004-08-20

*** Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

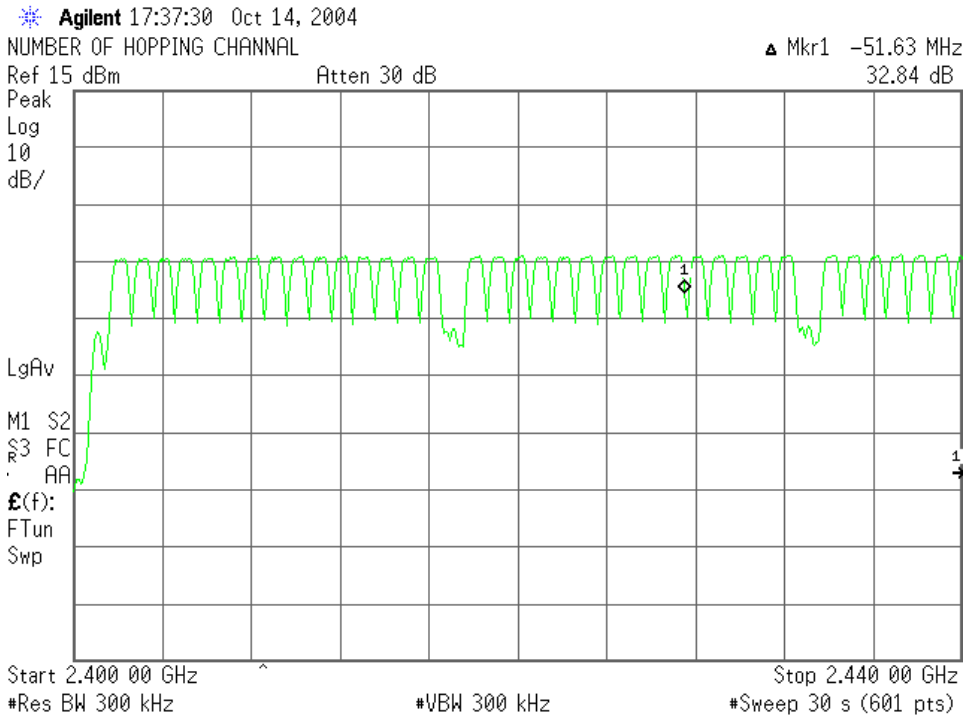
The testing was performed by Snell Leong on 2004-10-04.

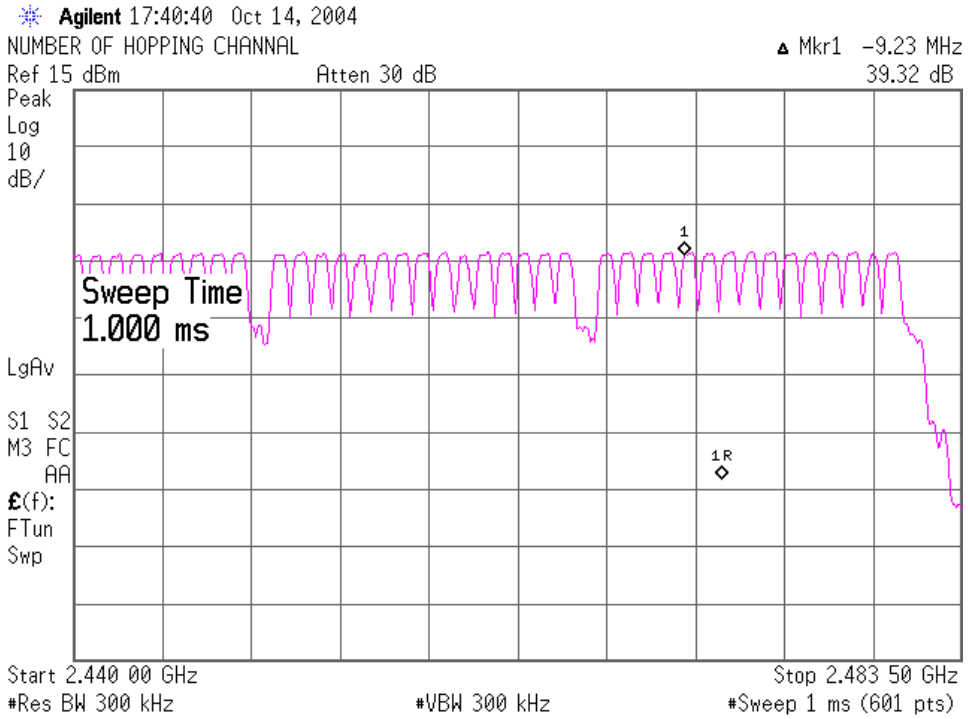
Measurement Results

Measurement	Standard	Result
75	75	Compliant

Plots of Number of Hopping Frequency

Please refer to the attached plots.


Agilent 17:37:30 Oct 14, 2004
NUMBER OF HOPPING CHANNAL
Mkr1 -51.63 MHz
Ref 15 dBm
Atten 30 dB
32.84 dB
Peak
Log
10
dB/
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 2.400 00 GHz
Stop 2.440 00 GHz
#Res BW 300 kHz
#VBW 300 kHz
#Sweep 30 s (601 pts)


Agilent 17:40:40 Oct 14, 2004
NUMBER OF HOPPING CHANNAL
Mkr1 -9.23 MHz
Ref 15 dBm
Atten 30 dB
39.32 dB
Peak
Log
10
dB/
Sweep Time
1.000 ms
LgAv
S1 S2
M3 FC
AA
£(f):
FTun
Swp
Start 2.440 00 GHz
Stop 2.483 50 GHz
#Res BW 300 kHz
#VBW 300 kHz
#Sweep 1 ms (601 pts)

§15.247 9 (a) (1) (iii) - DWELL TIME

Standard Applicable

According to §15.247 (a)(1)(iii), the average time of occupancy on any channel shall not be greater than 0.4 seconds within a period of 0.4 seconds multiplied by the number of hopping channels employed.

Measurement 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 was set 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 SA on any frequency be measured and set SA 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.

Test Equipment

Manufacturer	Model No.	Description	Serial Number	Calibration Date
Agilent	E4448A	Spectrum Analyzer	1030645	2004-08-20

*** Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

The testing was performed by Snell Leong on 2004-10-04.

Measurement Results

Channel	Frequency MHz	Pulse Wide uSec	Occupied time per Sec	Dwell Time Sec	Limit Sec	Result
Low	2402	444	10	0.14	0.4	pass
Mid	2441	448.3	10	0.142	0.4	
High	2480	450	10	0.142	0.4	

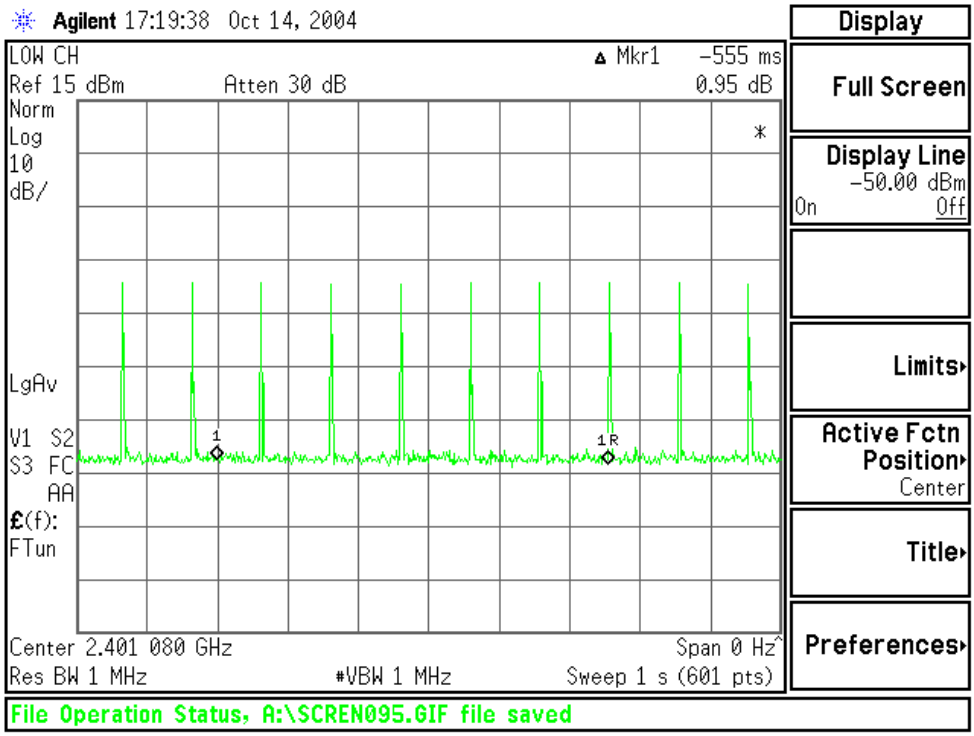
Low Channel : 10 x 444(us) x 75 X 0.4 = 0.13 Sec

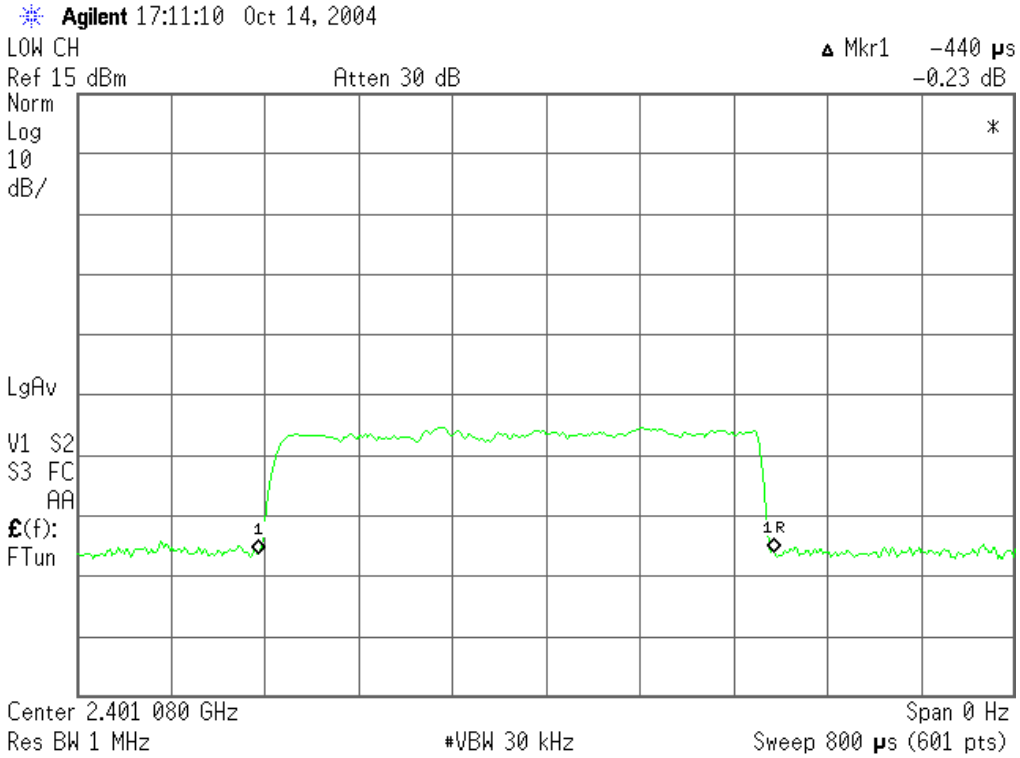
Mid Channel : 10 x 448.3(us) x 75 X 0.4 = 0.13 Sec

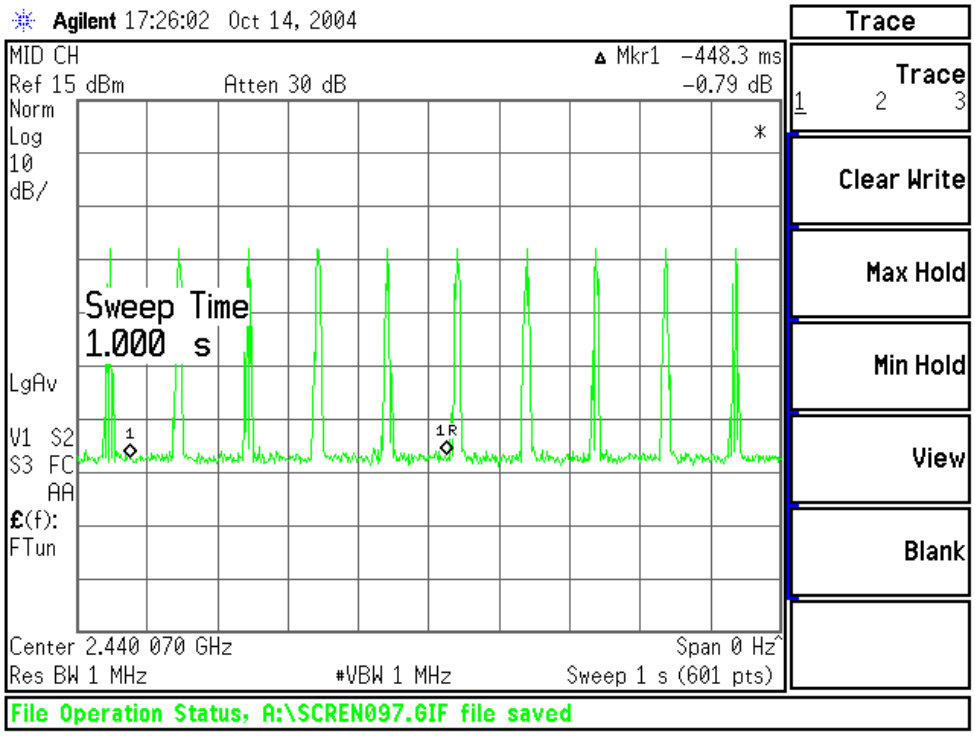
High Channel : 10 x 450(us) x 75 X 0.4 = 0.13 Sec

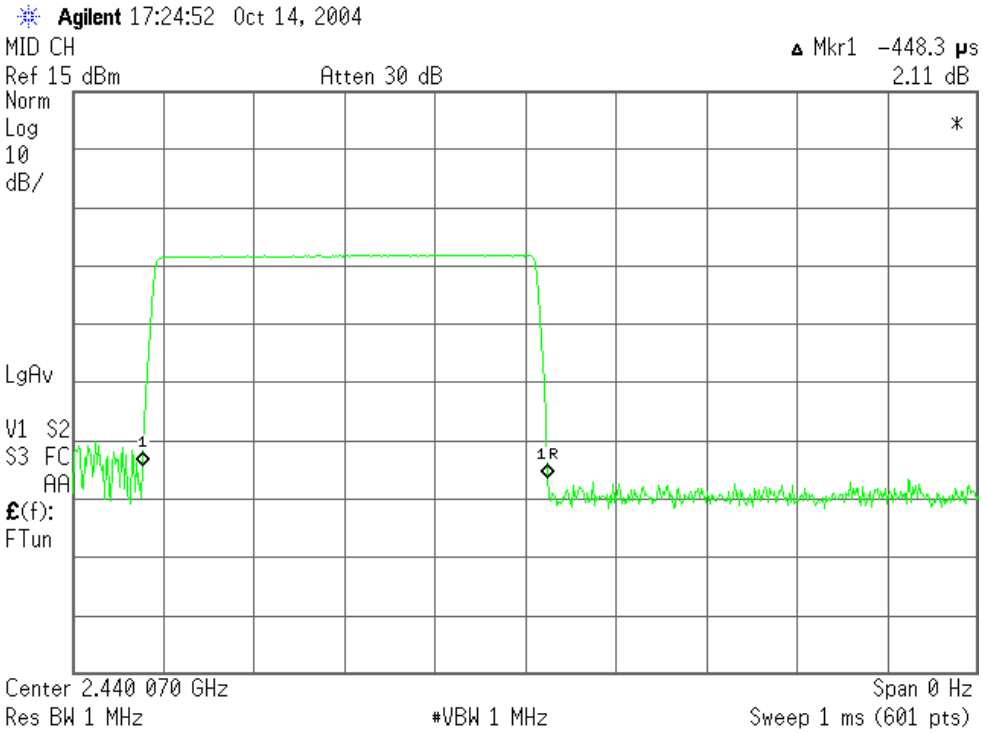
Plots of Dwell Time

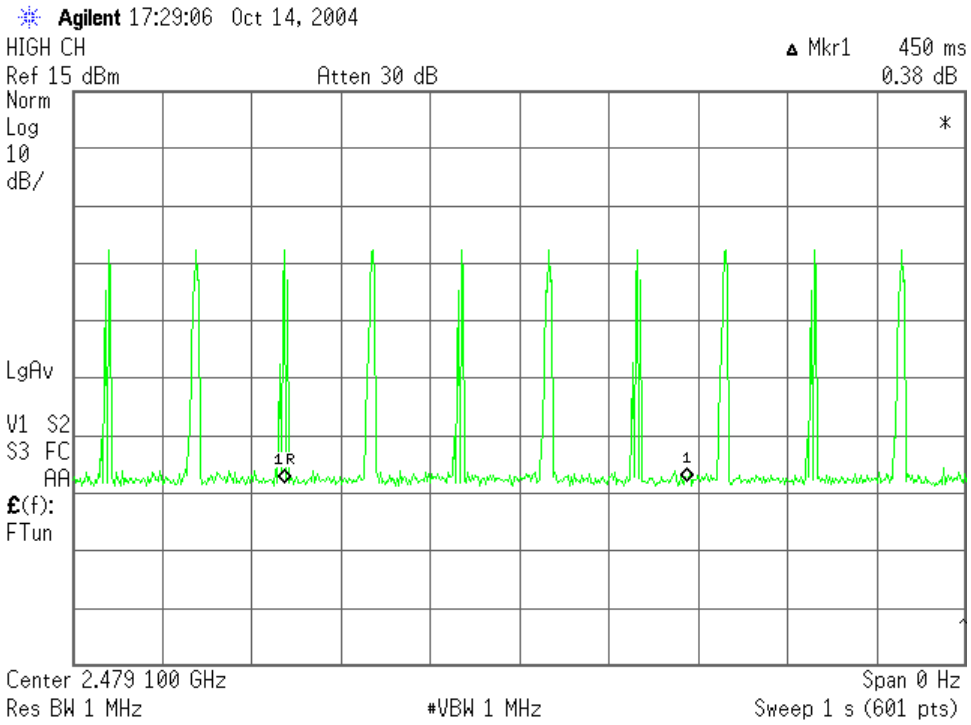
Please refer the following plots.

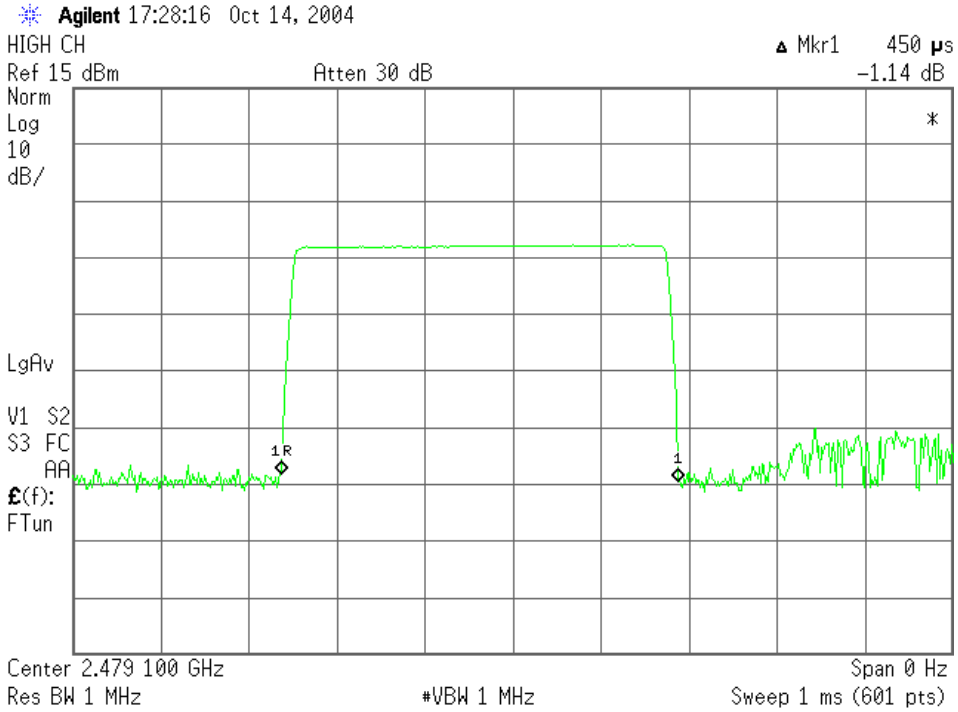

Agilent 17:19:38 Oct 14, 2004
LOW CH
Ref 15 dBm
Atten 30 dB
Mkr1 -555 ms
0.95 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 2.401 080 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 s (601 pts)
Display
Full Screen
Display Line
-50.00 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences
File Operation Status, A:\SCREN095.GIF file saved


Agilent 17:11:10 Oct 14, 2004
LOW CH
Ref 15 dBm
Atten 30 dB
Mkr1 -440 µs
-0.23 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 2.401 080 GHz
Res BW 1 MHz
#VBW 30 kHz
Span 0 Hz
Sweep 800 µs (601 pts)


Agilent 17:26:02 Oct 14, 2004
MID CH
Ref 15 dBm
Atten 30 dB
Mkr1 -448.3 ms
-0.79 dB
Norm
Log
10
dB/
Sweep Time
1.000 s
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 2.440 070 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 s (601 pts)
Trace
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
File Operation Status, A:\SCREN097.GIF file saved


Agilent 17:24:52 Oct 14, 2004
MID CH
Ref 15 dBm
Atten 30 dB
Mkr1 -448.3 µs
2.11 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 2.440 070 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 ms (601 pts)


Agilent 17:29:06 Oct 14, 2004
HIGH CH
Ref 15 dBm
Atten 30 dB
Mkr1 450 ms
0.38 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
1R
1
Center 2.479 100 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 s (601 pts)


Agilent 17:28:16 Oct 14, 2004
HIGH CH
Ref 15 dBm
Atten 30 dB
Mkr1 450 µs
-1.14 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
1R
1
Center 2.479 100 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 ms (601 pts)

§15.247 (b) (1) - MAXIMUM PEAK OUTPUT POWER

Standard Applicable

According to §15.247(b) (1), for frequency hopping systems in the 2400-2483.5MHz band employing at least 75 hopping channels, and all direct sequence systems, the maximum peak output power of the transmitter shall not exceed 1 Watt.

Measurement Procedure

1. Place the EUT on the turntable and set it in transmitting mode.
2. Remove the antenna from the EUT and then connect a low loss RF cable from the antenna port to the spectrum analyzer.

Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	2004-08-01

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

Environmental Conditions

Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

The testing was performed by Snell Leong on 2004-10-04.

Measurement Result

Channel	Frequency	Output Power in dBm	Output Power in W	Standard	Result
Low	2402	1.1	0.0012	1 W	pass
Mid	2441	1.15	0.0013	1 W	pass
High	2480	1.21	0.0013	1 W	pass

Plots of Maximum Peak Output Power

Please refer to following plots.

§15.247 (c) - 100 KHZ BANDWIDTH OF BAND EDGES

Standard Applicable

According to §15.247(c), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement. Attenuation below the general limits specified in §15.209(a) is not required.

Measurement 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 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 both RBW and VBW of spectrum analyzer to 300 kHz with a convenient frequency span including 100kHz bandwidth from band edge.
4. Measure the highest amplitude appearing on spectral display and set it as a reference level. Plot the graph with marking the highest point and edge frequency.
5. Repeat above procedures until all measured frequencies were complete.

Test Equipment

Manufacturer	Model No.	Description	Serial Number	Calibration Date
Agilent	E4448A	Spectrum Analyzer	1030645	2004-08-20

*** Statement of Traceability: BACL Corp.** certifies that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

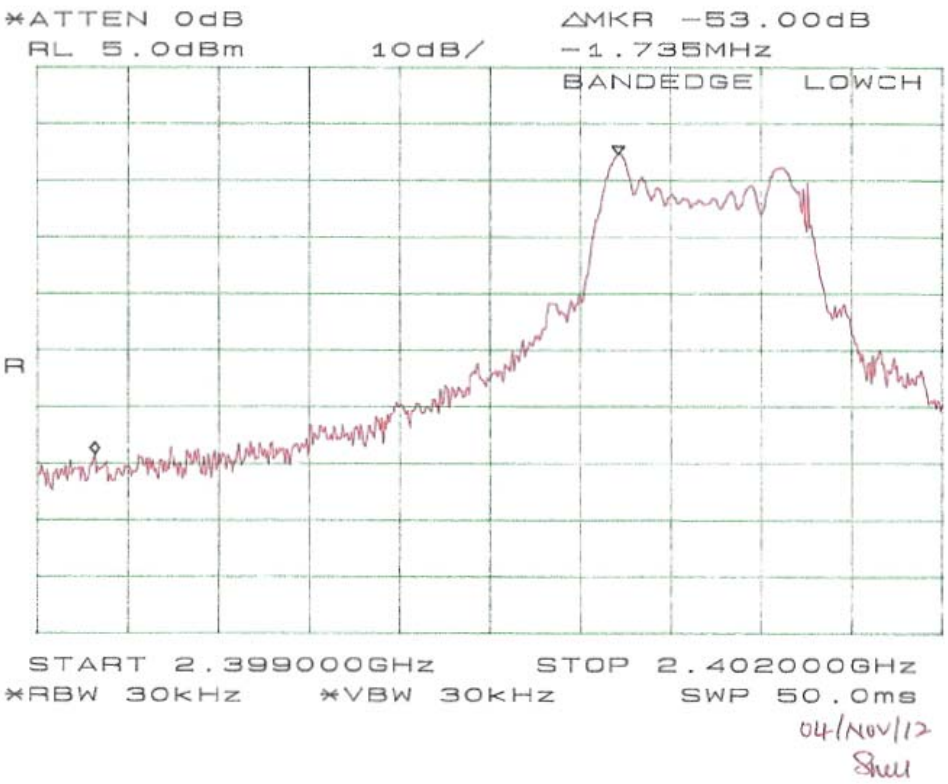
Environmental Conditions

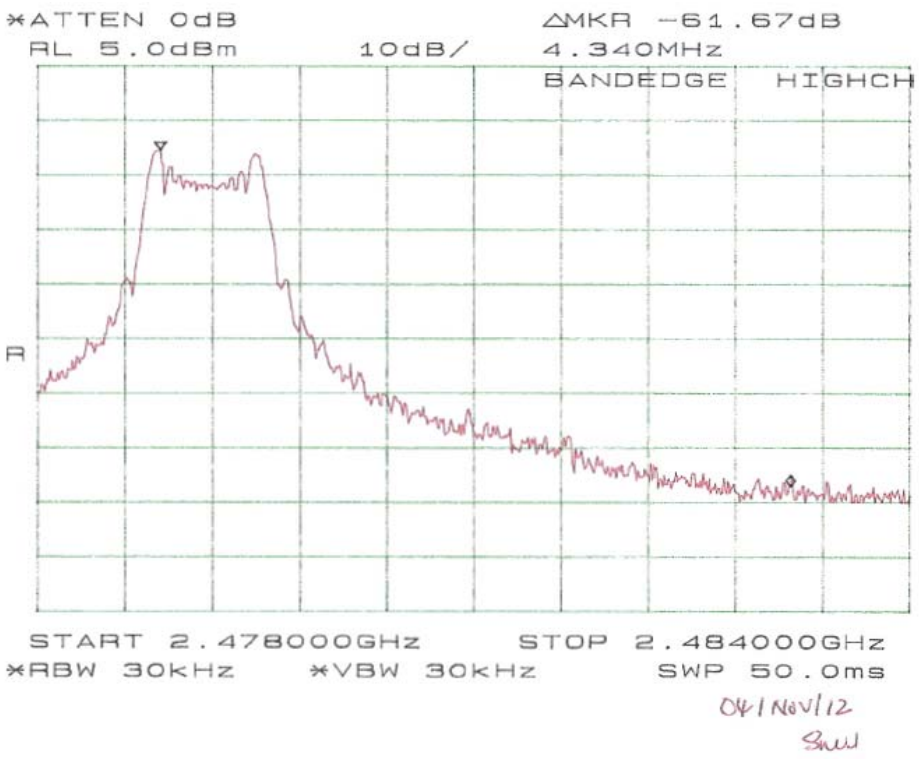
Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

The testing was performed by Snell Leong on 2004-10-04.

Plots of 100kHz Bandwidth of Band Edge

Please refer the following plots.


*ATTEN 0dB
RL 5.0dBm
10dB/
ΔMKR -53.00dB
-1.735MHz
BANDEDGE LOWCH
R
START 2.399000GHz
STOP 2.402000GHz
*RBW 30kHz
*VBW 30kHz
SWP 50.0ms
04/Nov/12
Shell


*ATTEN 0dB
RL 5.0dBm
10dB/
ΔMKR -61.67dB
4.340MHz
BANDEDGE HIGHCH
R
START 2.478000GHz
STOP 2.484000GHz
*RBW 30kHz
*VBW 30kHz
SWP 50.0ms
04/Nov/12
Shell

SPURIOUS EMISSION AT ANTENNA PORT

Standard Applicable

According to §15.209 (f) and §15.33(a), in some cases the emissions from an intentional radiator must be measured to beyond the tenth harmonic of the highest fundamental frequency designed to be emitted by the intentional radiator because of the incorporation of a digital device. If measurements above the tenth harmonic are so required, the radiated emissions above the tenth harmonic shall comply with the general radiated emission limits applicable to the incorporated digital device, as shown in §15.109 and as based on the frequency of the emission being measured, or, except for emissions contained in the restricted frequency bands shown in §15.205, the limit on spurious emissions specified for the intentional radiator, whichever is the higher limit.

Measurement Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.

2. Position the EUT on a bench 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 SA on Max-Hold Mode, and then keep the EUT in transmitting mode. Record all the signals from each channel until each one has been recorded.

4. Set the SA on View mode and then plot the result on SA screen.

5. Repeat above procedures until all frequencies measured were complete.

Test Equipment

Manufacturer	Model No.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	2004-08-01

* **Statement of Traceability:** BACL attests that all calibrations have been performed per the NVLAP requirements, traceable to NIST.

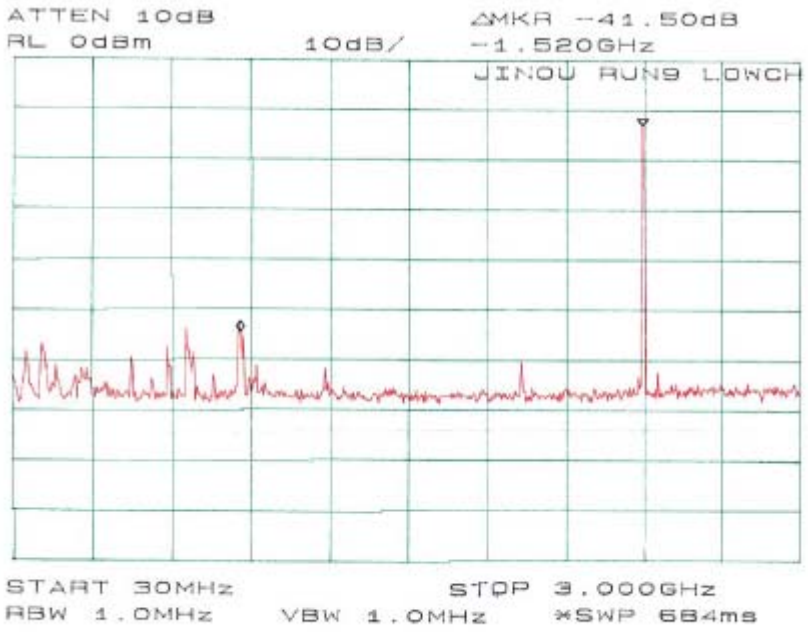
Environmental Conditions

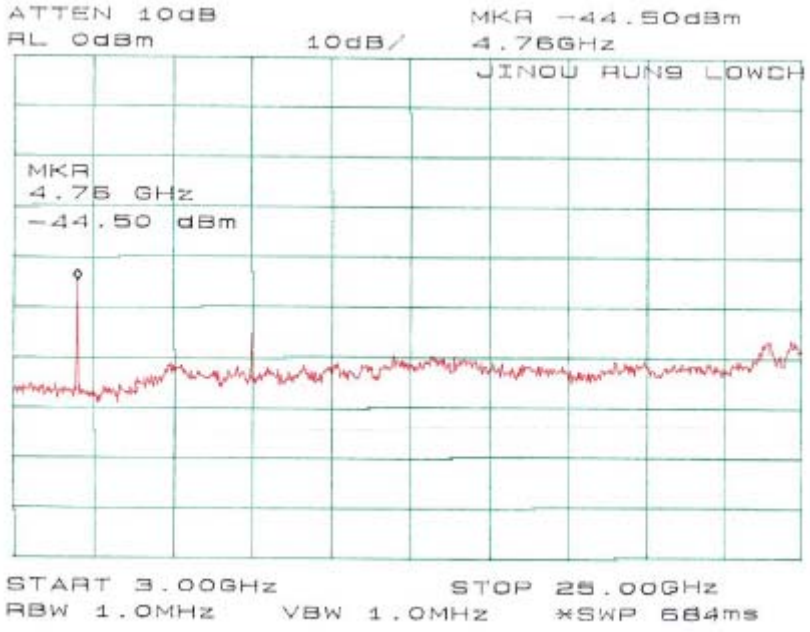
Temperature:	24° C
Relative Humidity:	40%
ATM Pressure:	1015 mbar

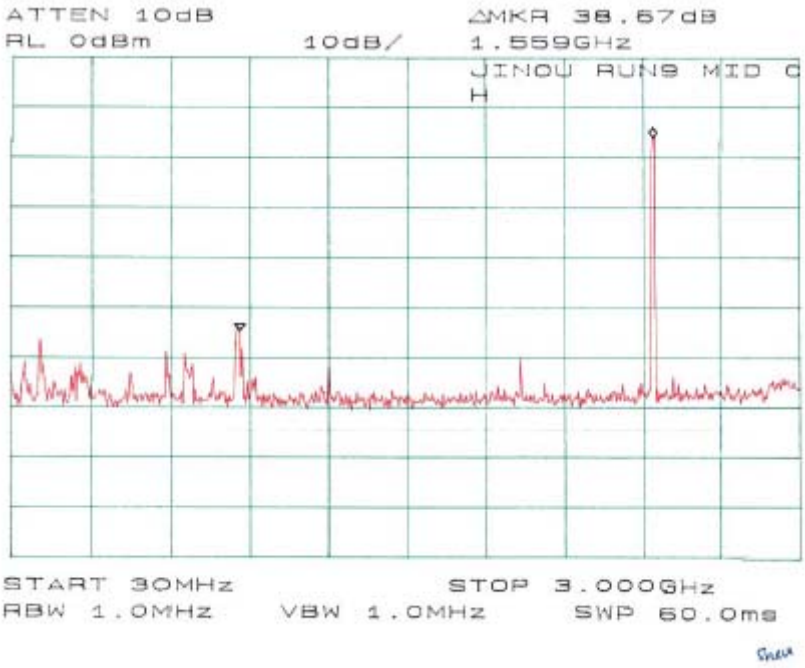
The testing was performed by Snell Leong on 2004-10-04.

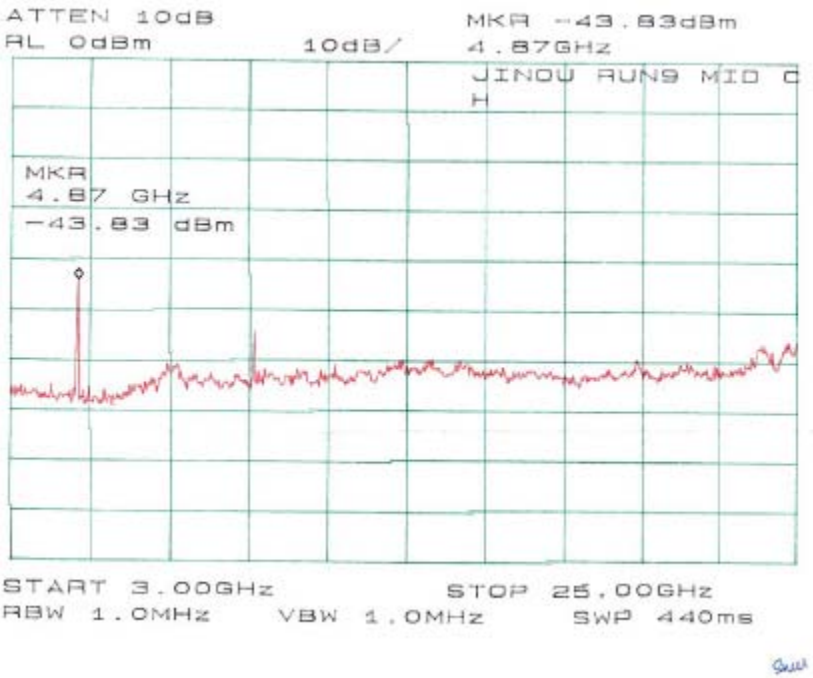
Measurement Results

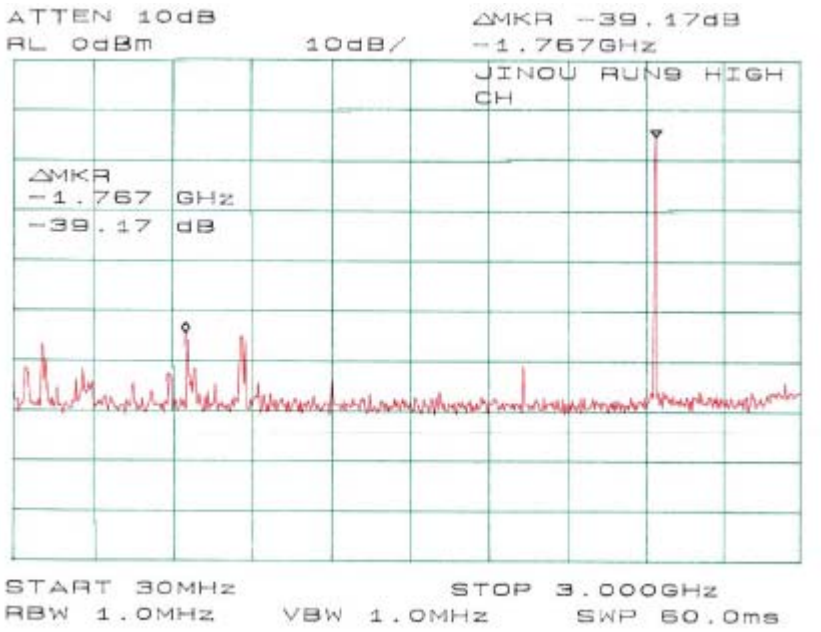
Please refer to the following plots.

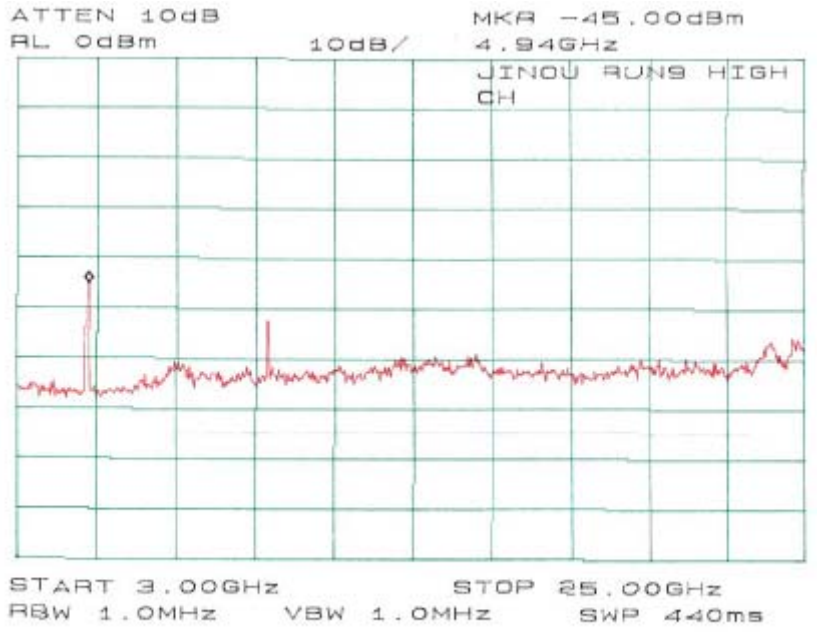

ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -41.50dB
-1.520GHz
JINOU RUN9 LOWCH
START 30MHz
STOP 3.000GHz
RBW 1.0MHz
VBW 1.0MHz
*SWP 684ms


ATTEN 10dB
RL 0dBm
10dB/
MKR -44.50dBm
4.76GHz
JINOU RUN9 LOWCH
MKR
4.76 GHz
-44.50 dBm
START 3.00GHz
STOP 25.00GHz
RBW 1.0MHz
VBW 1.0MHz
*SWP 684ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR 38.67dB
1.559GHz
JINOU RUN9 MID C
H
START 30MHz
STOP 3.000GHz
RBW 1.0MHz
VBW 1.0MHz
SWP 60.0ms


ATTEN 10dB
RL 0dBm
10dB/
MKR -43.83dBm
4.87GHz
JINOU RUN9 MID C
H
MKR
4.87 GHz
-43.83 dBm
START 3.00GHz
STOP 25.00GHz
RBW 1.0MHz
VBW 1.0MHz
SWP 440ms


ATTEN 10dB
RL 0dBm
10dB/
ΔMKR -39.17dB
-1.767GHz
JINOU RUN9 HIGH CH
ΔMKR
-1.767 GHz
-39.17 dB
START 30MHz
STOP 3.000GHz
RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


ATTEN 10dB
RL 0dBm
10dB/
MKR -45.00dBm
4.94GHz
JINOU RUN9 HIGH CH
START 3.00GHz
STOP 25.00GHz
RBW 1.0MHz
VBW 1.0MHz
SWP 440ms