FCC PART 15.247

EMI MEASUREMENT AND TEST REPORT

For

CCT R & D Limited

18F., CCT Telecom Building, 11 Wo Shing Street,
Fo Tan, Shatin, N.T.

FCC ID: NC8MD751H

This Report Concerns:	**Equipment Type:**
☒ Original Report	Digital 2.4/5.8GHz Cordless Telephone System w/ Caller ID – Handset

Test Engineer:	Ling Zhang /
Report No.:	R0407072(H)
Report Date:	2004-08-04
Reviewed By:	Ming Jing /
Prepared By:	Bay Area Compliance Laboratory Corporation (BACL) 230 Commercial Street Sunnyvale, CA 94085 Tel: (408) 732-9162 Fax: (408) 732 9164

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *CCT R & D Limited's*, model: *MD751 / MD761,* or the "EUT" as referred to in this report is the handset part of a Digital 2.4/5.8GHz Cordless Telephone System w/ Caller ID, which measures approximately 185mmL x 56mm W x 30mm H. The EUT is a DTS device, which operates at the frequency range of 2401.8085 – 2479.4012MHz, with the maximum conducted output power of 16.50dBm (44.67mW).

** The test data gathered are from a production sample, S/N: MD751-02 (for Model: MD751) & M761A-USA-SSR1(for Model: MD761), provided by the manufacturer.*

Objective

This type approval report is prepared on behalf of *CCT R & D Limited* in accordance with Part 2, Subpart J, Part 15, Subparts A, B, C, and Part 24 Subpart E of the Federal Communication Commissions rules.

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
- 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.

The EUT was tested in the normal (native) operating mode to represent *worst*-case results during the final qualification test.

EUT Exercise Software

The EUT exercise program used during radiated and conducted testing was designed to exercise the system components.

Once loaded, set the Tx channel to low, mid and high for testing.

Special Accessories

As shown in following test block diagram, all interface cables used for compliance testing are shielded.

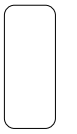
Schematics / Block Diagram

Please refer to Appendix A.

Equipment Modifications

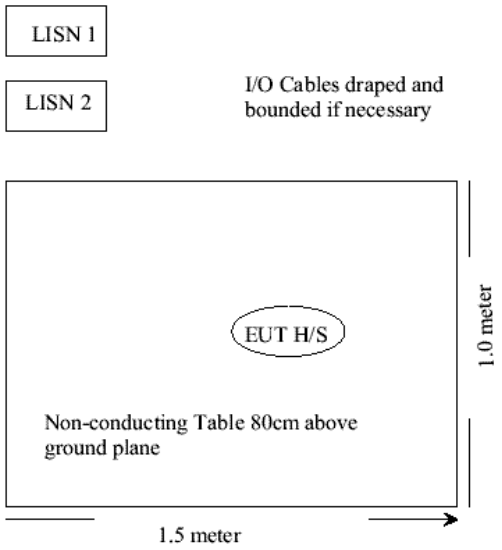
No modifications were made to the EUT.

Configuration of Test System



Handset

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
§15.209	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

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. Please see EUT photo for details.

§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.

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	2003-08-04
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	2003-09-30
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	2455-261	2003-08-01
ETS	Antenna, logperiodic	3148	0004-1155	2003-10-11

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

Environmental Conditions

Temperature:	23° C
Relative Humidity:	35%
ATM Pressure:	1019 mbar

The testing was performed by Ling Zhang on 2004-07-16.

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 complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.207, and 15.247, and had the worst margin of:

-11.74 dB at **7205.425 MHz** in the **Horizontal** polarization, Low Channel.

-11.87 dB at **7320.477 MHz** in the **Vertical** polarization, Middle Channel.

-11.87 dB at **7438.204 MHz** in the **Vertical** polarization, High Channel.

-7.48 dB at **484.800 MHz** in the **Vertical** polarization, Unintentional Emission.

Radiated Emission Test Data

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C		
Freqency	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											
2401.808	117.30	270	1.4	v	28.1	2.0	35.83	111.57			Fund/Peak
2401.808	113.50	30	2.0	h	28.1	2.0	35.83	107.77			Fund/Peak
2401.808	58.83	270	1.4	v	28.1	2.0	35.83	53.10			Fund/Ave
2401.808	58.50	30	1.1	h	28.1	2.0	35.83	52.77			Fund/Ave
7205.425	36.33	45	1.6	h	36.3	4.3	34.67	42.26	54	-11.74	Ave
7205.425	36.17	30	1.2	v	36.3	4.3	34.67	42.10	54	-11.90	Ave
4803.617	35.33	330	1.4	v	32.5	3.1	34.83	36.10	54	-17.90	Ave
4803.617	35.33	30	1.5	h	32.5	3.1	34.83	36.10	54	-17.90	Ave
4803.617	55.17	30	1.5	h	32.5	3.1	34.83	55.94	74	-18.06	Peak
4803.617	54.83	330	1.4	v	32.5	3.1	34.83	55.60	74	-18.40	Peak
7205.425	49.67	30	1.2	v	36.3	4.3	34.67	55.60	74	-18.40	Peak
7205.425	48.50	45	1.6	h	36.3	4.3	34.67	54.43	74	-19.57	Peak
Middle Channel											
2440.159	116.00	0	1.4	v	28.1	2.0	35.83	110.27			Fund/Peak
2440.159	112.67	60	1.6	h	28.1	2.0	35.83	106.94			Fund/Peak
2440.159	58.67	0	1.4	v	28.1	2.0	35.83	52.94			Fund/Ave
2440.159	58.00	60	1.6	h	28.1	2.0	35.83	52.27			Fund/Ave
7320.477	36.20	180	1.5	v	36.3	4.3	34.67	42.13	54	-11.87	Ave
7320.477	36.20	60	1.6	h	36.3	4.3	34.67	42.13	54	-11.87	Ave
7320.477	50.80	180	1.5	v	36.3	4.3	34.67	56.73	74	-17.27	Peak
4880.318	55.50	0	1.5	v	32.5	3.1	34.83	56.27	74	-17.73	Peak
4880.318	35.30	0	1.5	v	32.5	3.1	34.83	36.07	54	-17.93	Ave
4880.318	35.20	45	1.8	h	32.5	3.1	34.83	35.97	54	-18.03	Ave
7320.477	49.20	60	1.6	h	36.3	4.3	34.67	55.13	74	-18.87	Peak
4880.318	53.67	45	1.8	h	32.5	3.1	34.83	54.44	74	-19.56	Peak
High Channel											
2479.401	114.17	270	1.6	v	28.1	2.0	35.83	108.44			Fund/Peak
2479.401	111.50	180	2.0	h	28.1	2.0	35.83	105.77			Fund/Peak
2479.401	58.50	270	1.6	v	28.1	2.0	35.83	52.77			Fund/Ave
2479.401	58.17	180	2.0	h	28.1	2.0	35.83	52.44			Fund/Ave
7438.204	36.20	270	1.4	v	36.3	4.3	34.67	42.13	54	-11.87	Ave
7438.204	36.10	150	2.2	h	36.3	4.3	34.67	42.03	54	-11.97	Ave
4958.802	35.50	90	1.4	v	32.5	3.1	34.83	36.27	54	-17.73	Ave
7438.204	50.20	270	1.4	v	36.3	4.3	34.67	56.13	74	-17.87	Peak
4958.802	35.30	0	1.8	h	32.5	3.1	34.83	36.07	54	-17.93	Ave
7438.204	49.67	150	2.2	h	36.3	4.3	34.67	55.60	74	-18.40	Peak
4958.802	54.67	0	1.8	h	32.5	3.1	34.83	55.44	74	-18.56	Peak
4958.802	54.33	90	1.4	v	32.5	3.1	34.83	55.10	74	-18.90	Peak

Note:

FUND: Fundemental
AVG: Average

Unintentional Emission

Indicated			Antenna	Antenna		Correction Factor			FCC 15 Subpart C	
Frequency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin
MHz	dBμV/m	Degree	Meter	H/V	dBμV/m	dBμV/m	dB	dBμV/m	dBμV/m	dB
484.800	48.50	30	1.8	v	18.3	0.5	28.78	38.52	46	-7.48
484.800	47.33	60	1.5	h	18.3	0.5	28.78	37.35	46	-8.65
877.500	41.17	180	1.6	v	22.4	0.9	28.49	35.98	46	-10.02
877.500	39.80	90	1.4	h	22.4	0.8	28.49	34.51	46	-11.49
175.275	45.50	30	1.2	v	13.1	0.2	28.31	30.49	43.5	-13.01
180.267	42.33	330	1.5	v	13.2	0.2	28.29	27.44	43.5	-16.06

§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	Calibration Date
Agilent	8564E	Spectrum Analyzer	2003-08-01

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

Environmental Conditions

Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

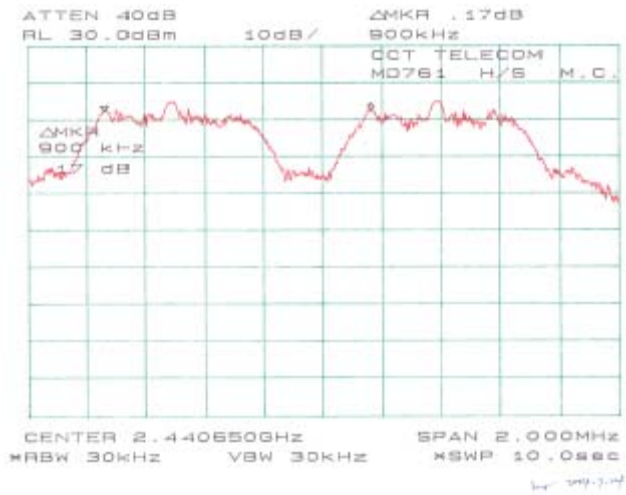
The testing was performed by Ling Zhang on 2004-07-24.

Measurement Results

Channel	Measurement (KHz)	Result
Low	897	Compliant
Middle	900	Compliant
High	897	Compliant

Plots of Hopping Channel Separation

Please refer to the following plots.



§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.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	2003-08-01

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

Environmental Conditions

Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

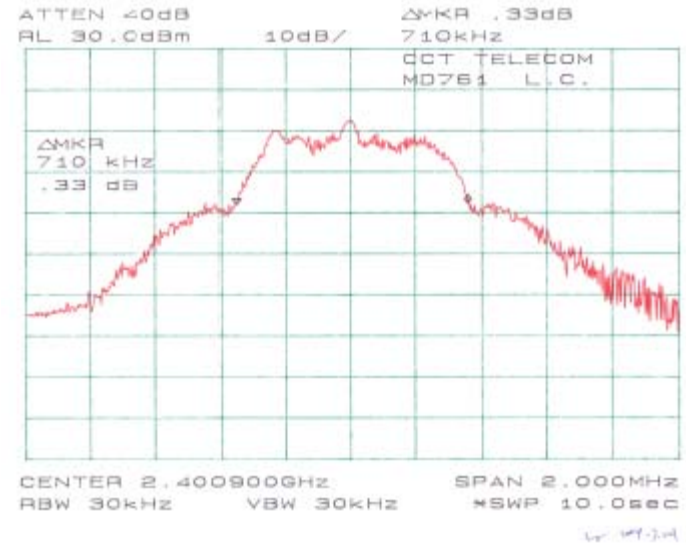
The testing was performed by Ling Zhang on 2004-07-24.

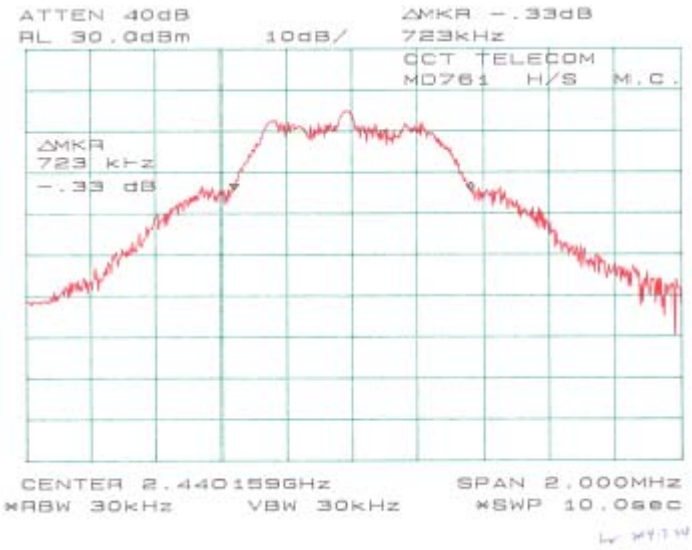
Measurement Result

Frequency	Measurement (kHz)	Standard	Result
Low	710	≤ 1MHz	Compliant
Middle	723	≤ 1MHz	Compliant
High	720	≤ 1MHz	Compliant

Plot of Channel Bandwidth

Please see the following plots


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR .33dB
710kHz
CCT TELECOM
MD761 L.C.
ΔMKR
710 kHz
.33 dB
CENTER 2.400900GHz
SPAN 2.000MHz
RBW 30kHz
VBW 30kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -.33dB
723kHz
CCT TELECOM
MD761 H/S M.C.
ΔMKR
723 kHz
-.33 dB
CENTER 2.440159GHz
SPAN 2.000MHz
*RBW 30kHz
VBW 30kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR .67dB
720kHz
CCT TELECOM
MD761 H/S H.C.
ΔMKR
720 kHz
.67 dB
CENTER 2.479401GHz
SPAN 2.000MHz
*RBW 30kHz
VBW 30kHz
*SWP 10.0sec

§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.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	2003-08-01

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

Environmental Conditions

Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

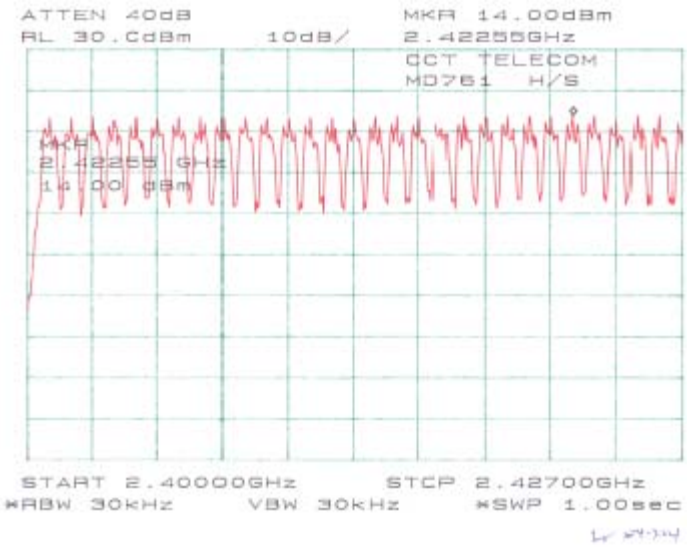
The testing was performed by Ling Zhang on 2004-07-24.

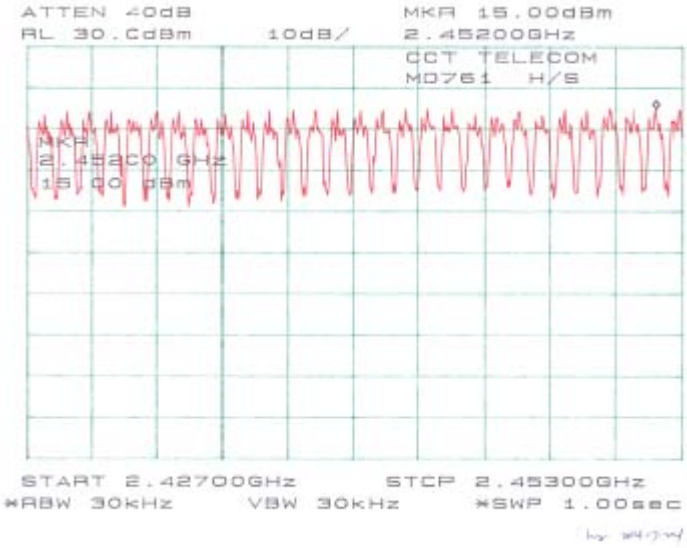
Measurement Results

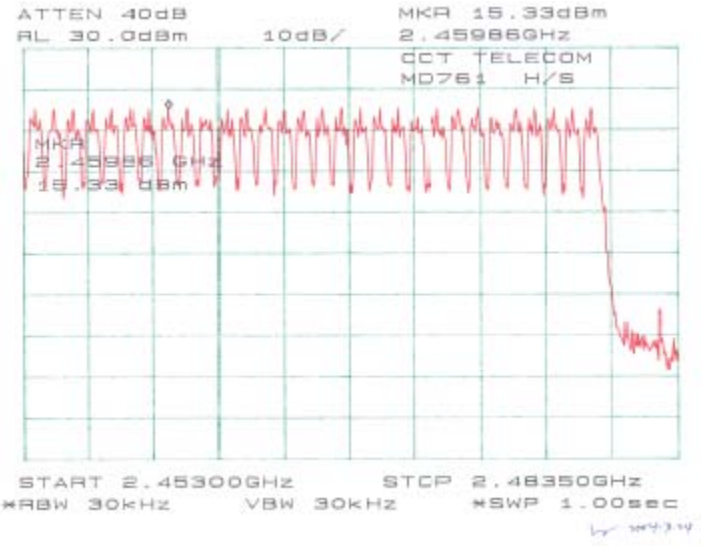
Measurement	Standard	Result
88	75	Compliant

Plots of Number of Hopping Frequency

Please refer to the attached plots.


ATTEN 40dB
RL 30.CdBm
10dB/
MKR 14.00dBm
2.42255GHz
CCT TELECOM
MD761 H/S
MKR
2.42255 GHz
14.00 dBm
START 2.40000GHz
STOP 2.42700GHz
*RBW 30kHz
VBW 30kHz
*SWP 1.00sec


ATTEN 40dB
RL 30.CdBm
10dB/
MKR 15.00dBm
2.45200GHz
CCT TELECOM
MD761 H/S
MKR
2.45200 GHz
15.00 dBm
START 2.42700GHz
STOP 2.45300GHz
*RBW 30kHz
VBW 30kHz
*SWP 1.00sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 15.33dBm
2.45986GHz
CCT TELECOM
MD761 H/S
MKR
2.45986 GHz
15.33 dBm
START 2.45300GHz
STOP 2.48350GHz
*RBW 30kHz
VBW 30kHz
*SWP 1.00sec

§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.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	2003-08-01

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

Environmental Conditions

Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

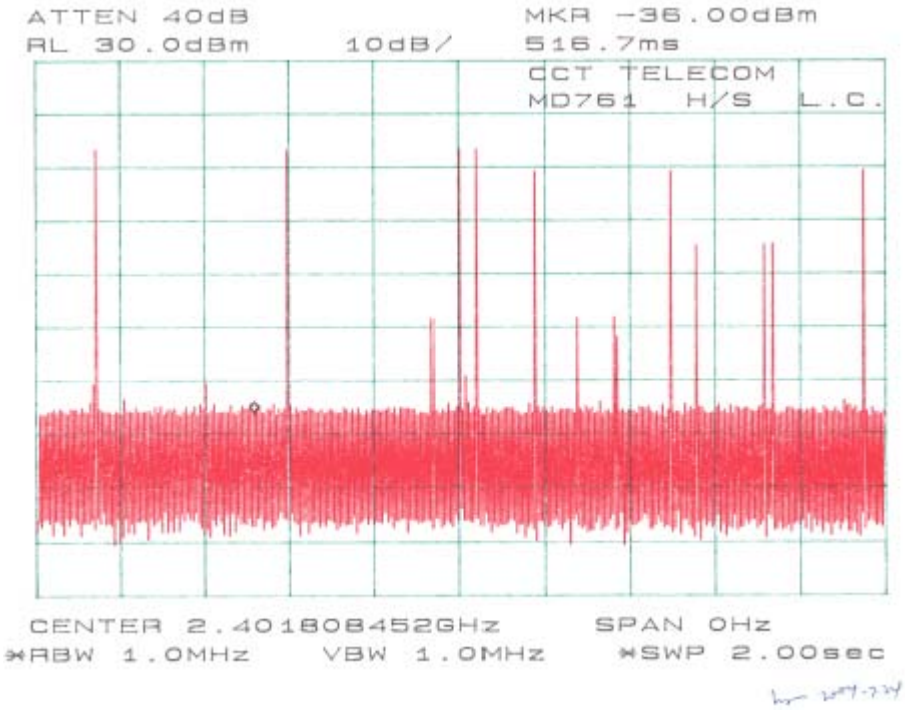
The testing was performed by Ling Zhang on 2004-07-24.

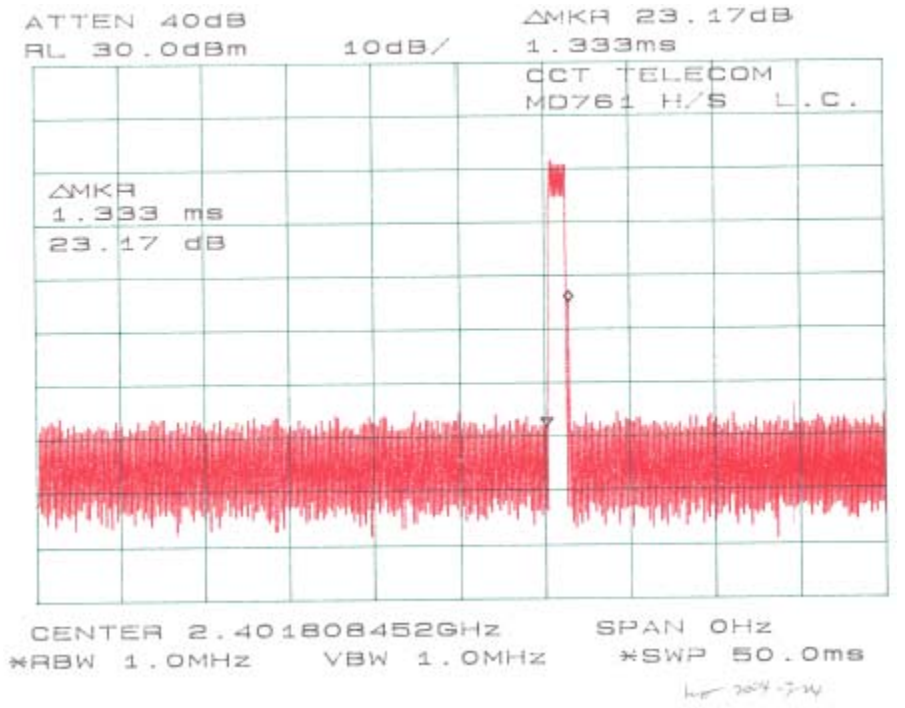
Measurement Results

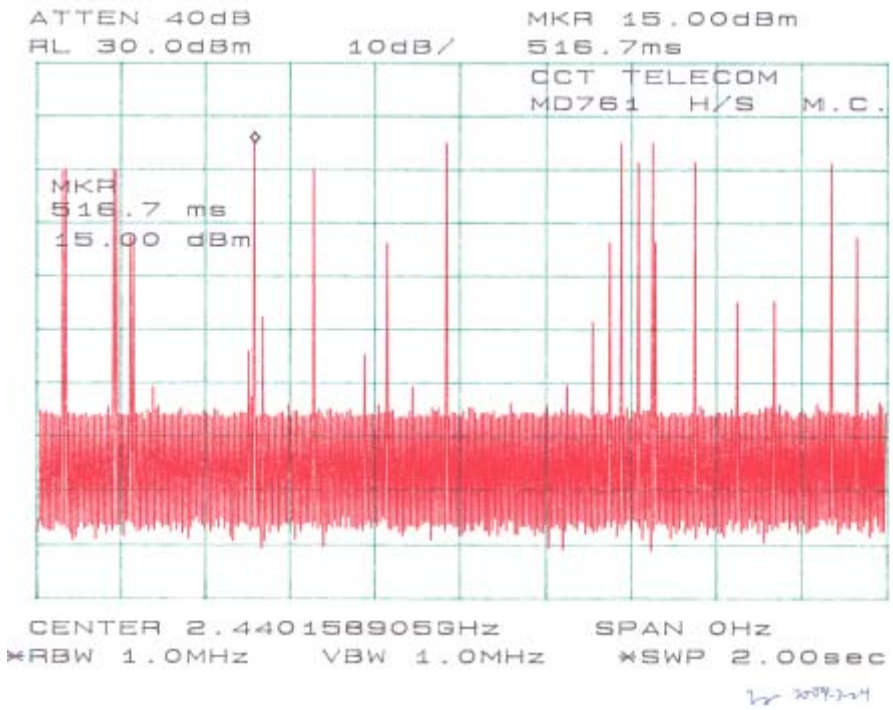
Low, Mid, High Channels: 5 x 1.333(ms) x [(88x0.4) / 2 (s)] = 0.117 s < 0.4 s

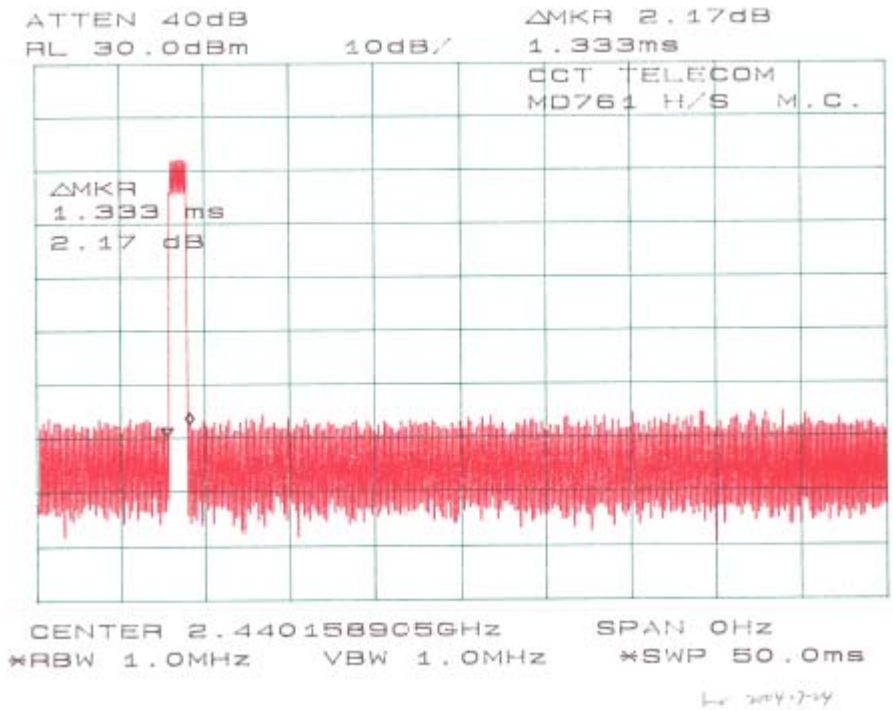
Plots of Dwell Time

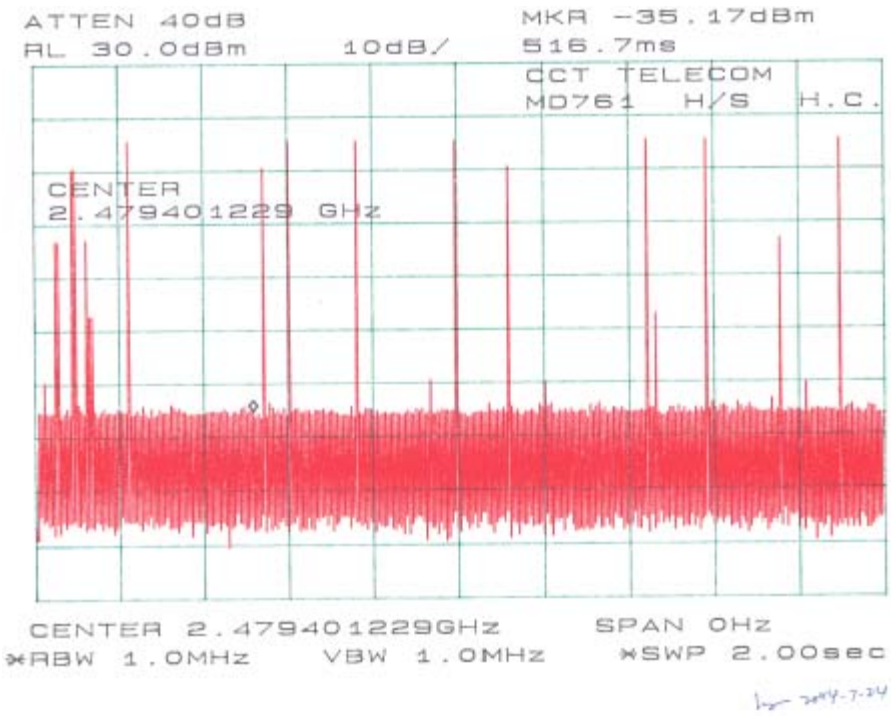
Please refer the following plots.

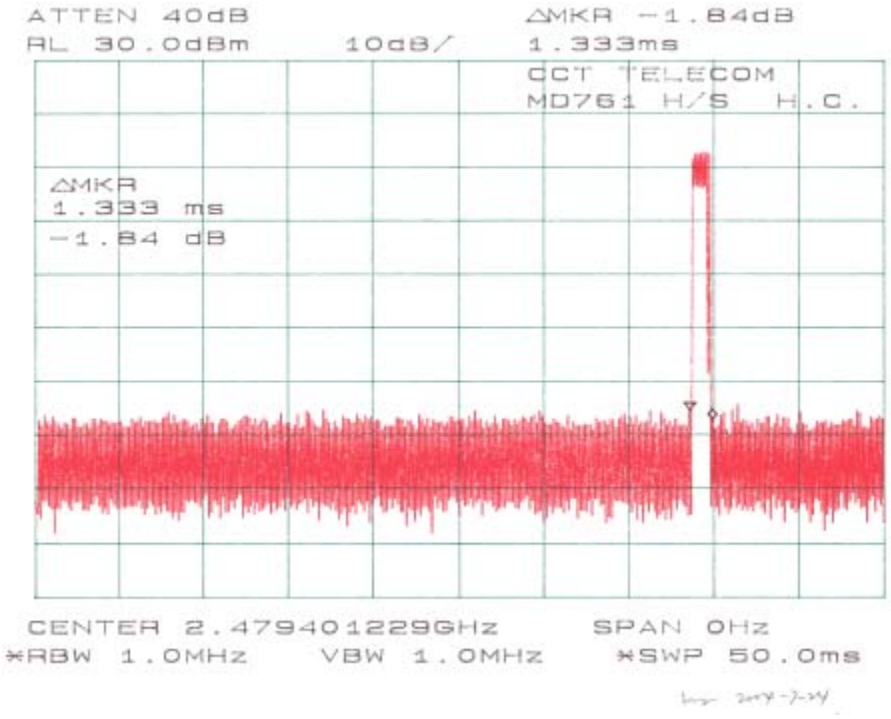

ATTEN 40dB
RL 30.0dBm
10dB/
MKR -36.00dBm
516.7ms
CCT TELECOM
MD761 H/S L.C.
CENTER 2.401808452GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 2.00sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 23.17dB
1.333ms
CCT TELECOM
MD761 H/S L.C.
ΔMKR
1.333 ms
23.17 dB
CENTER 2.401808452GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 15.00dBm
516.7ms
CCT TELECOM
MD761 H/S M.C.
MKR
516.7 ms
15.00 dBm
CENTER 2.440158905GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 2.00sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 2.17dB
1.333ms
CCT TELECOM
MD761 H/S M.C.
ΔMKR
1.333 ms
2.17 dB
CENTER 2.440158905GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -35.17dBm
516.7ms
CCT TELECOM
MD761 H/S H.C.
CENTER
2.479401229 GHz
CENTER 2.479401229GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 2.00sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -1.84dB
1.333ms
CCT TELECOM
MD761 H/S H.C.
ΔMKR
1.333 ms
-1.84 dB
CENTER 2.479401229GHz
SPAN 0Hz
*RBW 1.0MHz
VBW 1.0MHz
*SWP 50.0ms

§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	2003-08-01

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

Environmental Conditions

Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

The testing was performed by Ling Zhang on 2004-07-24.

Measurement Result

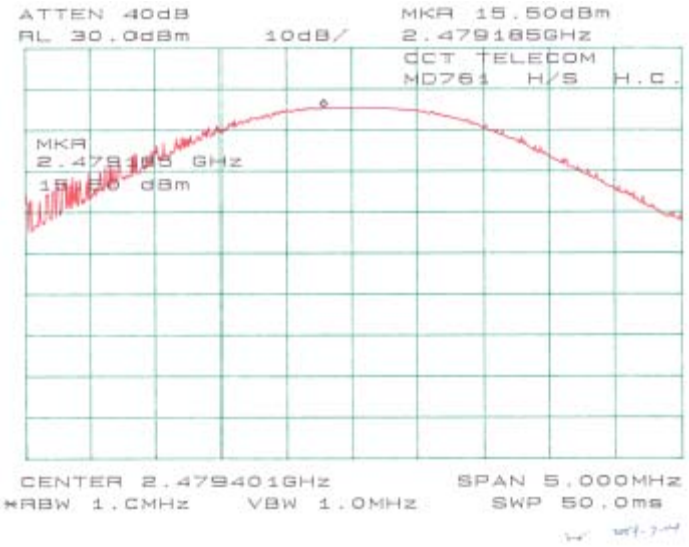
Channel	Frequency (MHz)	Output Power (dBm)	Cable Loss (dB)	Corrected Output Power (dBm)	Corrected Output Power (W)	Standard	Result
Low	2400.933	14.67	1.0	15.67	0.037	≤ 1W	Compliant
Middle	2440.150	15.33	1.0	16.33	0.043	≤ 1W	Compliant
High	2479.401	15.50	1.0	16.50	0.045	≤ 1W	Compliant

Plots of Maximum Peak Output Power

Please refer to following plots.


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 14.67dBm
2.400792GHz
CCT TELECOM
MD761 H/S L.C.
MKR
2.400792 GHz
14.67 dBm
CENTER 2.400933GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 15.33dBm
2.439958GHz
CCT TELECOM
MD761 H/S M.C.
MKR
2.439958 GHz
15.33 dBm
CENTER 2.440150GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
MKR 15.50dBm
2.479185GHz
CCT TELECOM
MD761 H/S H.C.
MKR
2.479185 GHz
15.50 dBm
CENTER 2.479401GHz
SPAN 5.000MHz
*RBW 1.0MHz
VBW 1.0MHz
SWP 50.0ms

§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 100 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.	Serial No.	Calibration Date
Agilent	8564E	Spectrum Analyzer	2003-08-01

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

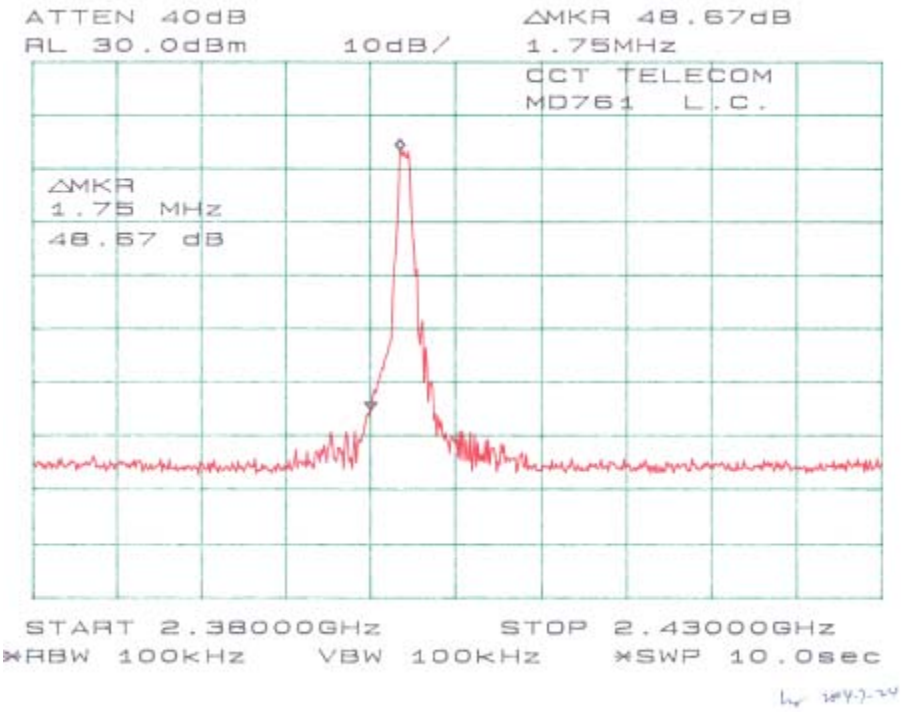
Environmental Conditions

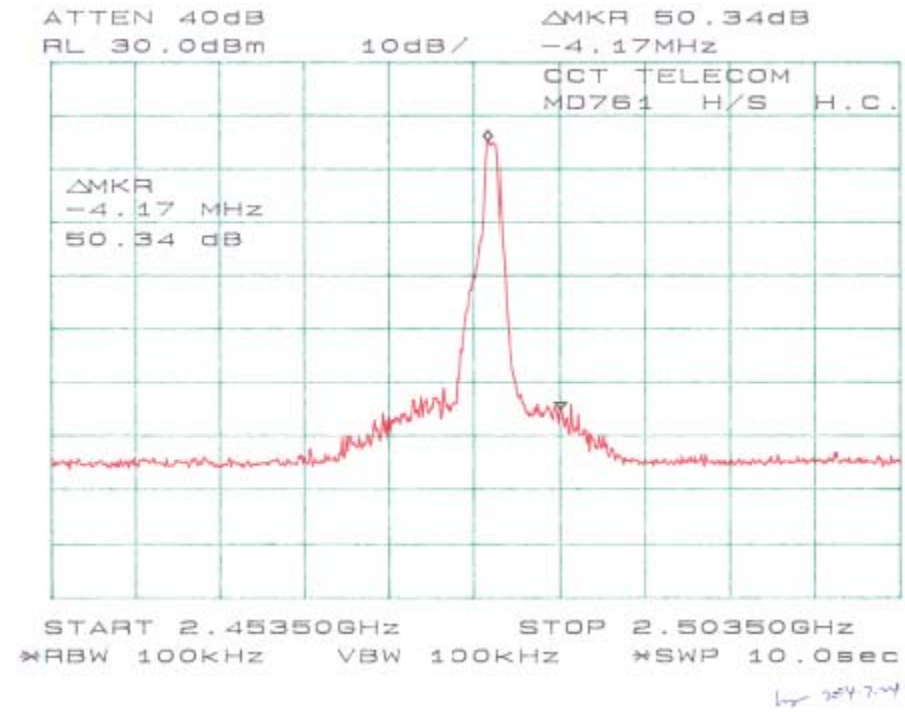
Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

The testing was performed by Ling Zhang on 2004-07-24.

Plots of 100kHz Bandwidth of Band Edge

Please refer the following plots.


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 48.67dB
1.75MHz
CCT TELECOM
MD761 L.C.
ΔMKR
1.75 MHz
48.67 dB
START 2.38000GHz
STOP 2.43000GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR 50.34dB
-4.17MHz
CCT TELECOM
MD761 H/S H.C.
ΔMKR
-4.17 MHz
50.34 dB
START 2.45350GHz
STOP 2.50350GHz
*RBW 100kHz
VBW 100kHz
*SWP 10.0sec

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	2003-08-01

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

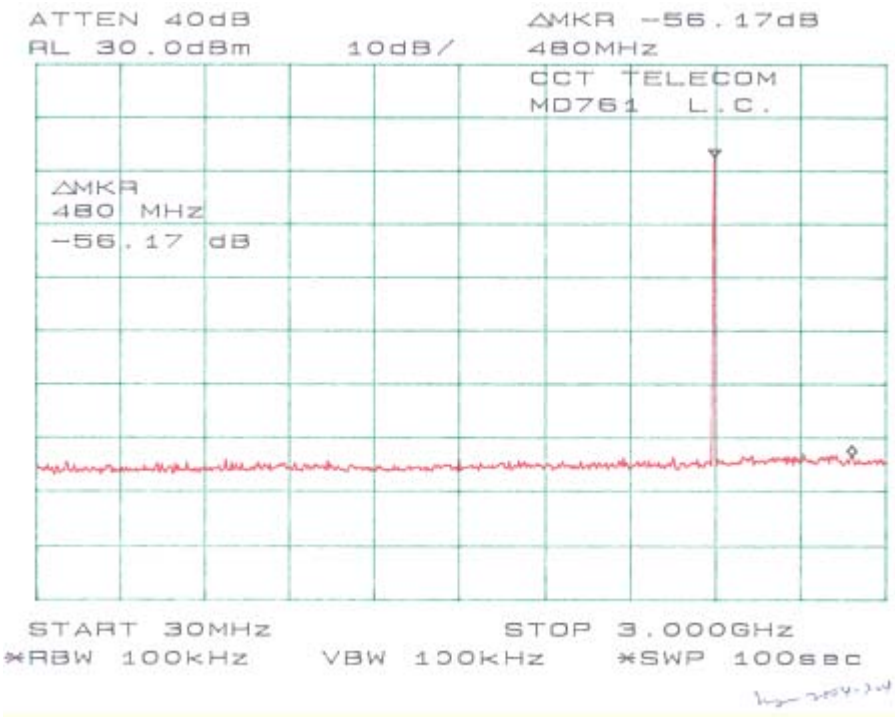
Environmental Conditions

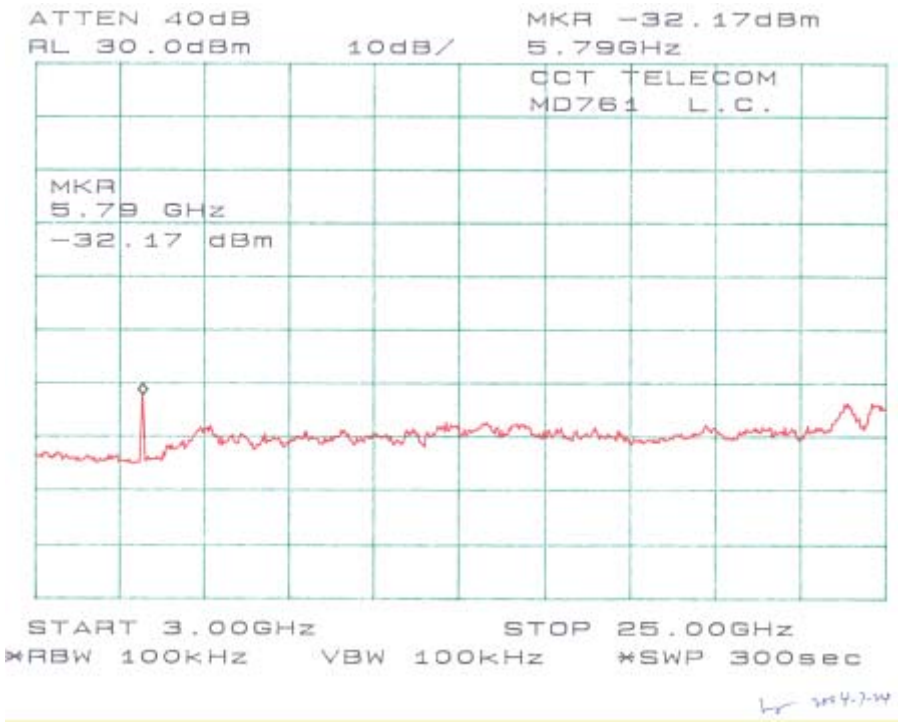
Temperature:	26° C
Relative Humidity:	47%
ATM Pressure:	1016 mbar

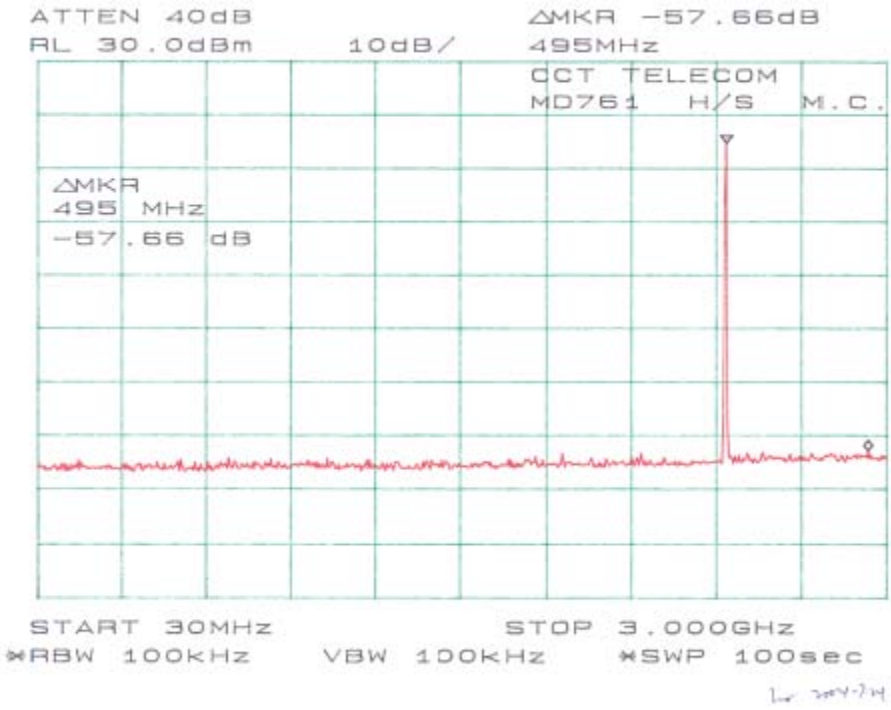
The testing was performed by Ling Zhang on 2004-07-24.

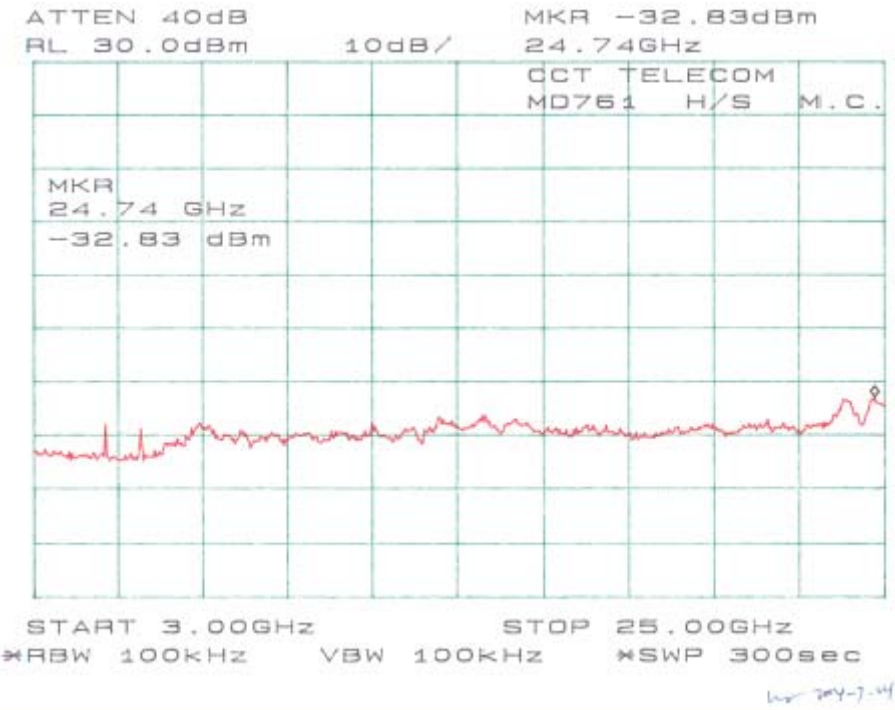
Measurement Results

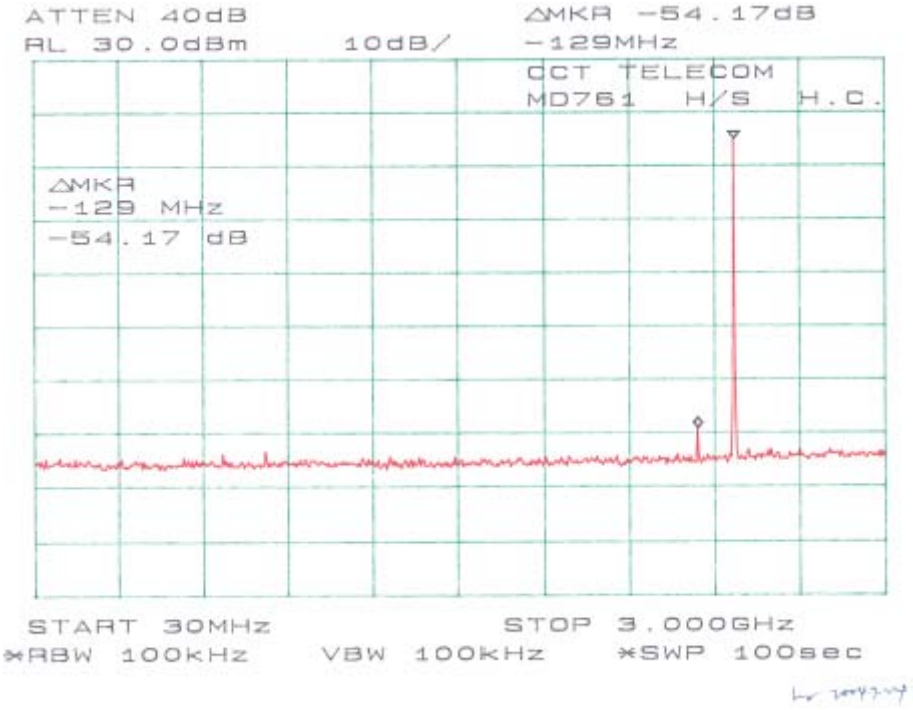
Please refer to the following plots.

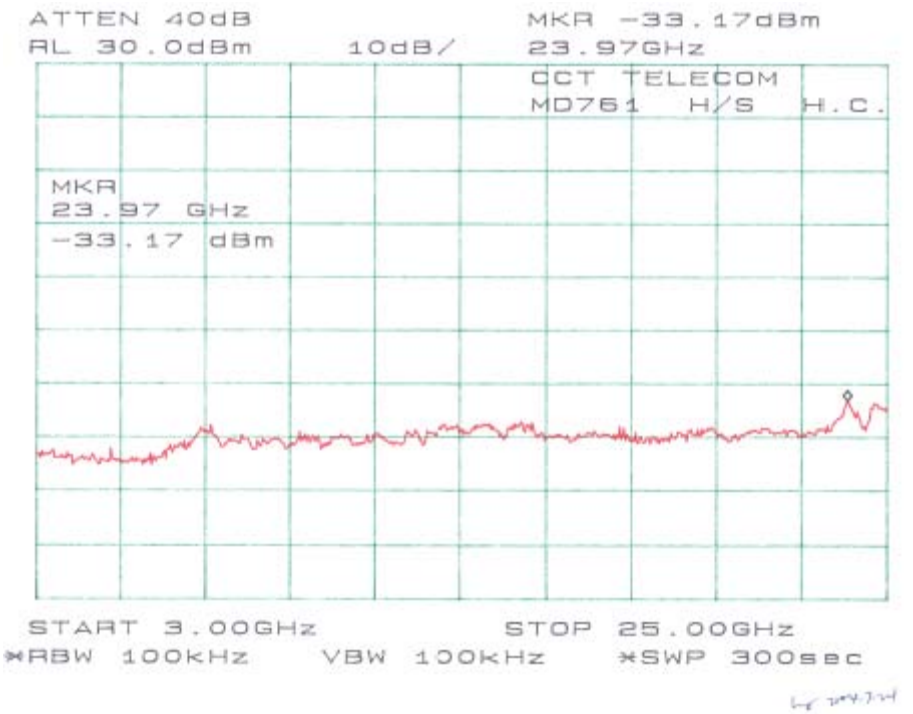

ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -56.17dB
480MHz
CCT TELECOM
MD761 L.C.
ΔMKR
480 MHz
-56.17 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -32.17dBm
5.79GHz
CCT TELECOM
MD761 L.C.
MKR
5.79 GHz
-32.17 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -57.66dB
495MHz
CCT TELECOM
MD761 H/S M.C.
ΔMKR
495 MHz
-57.66 dB
START 30MHz
STOP 3.000GHz
#RBW 100kHz
VBW 100kHz
#SWP 100sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -32.83dBm
24.74GHz
CCT TELECOM
MD761 H/S M.C.
MKR
24.74 GHz
-32.83 dBm
START 3.00GHz
STOP 25.00GHz
#RBW 100kHz
VBW 100kHz
#SWP 300sec


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -54.17dB
-129MHz
CCT TELECOM
MD761 H/S H.C.
ΔMKR
-129 MHz
-54.17 dB
START 30MHz
STOP 3.000GHz
*RBW 100kHz
VBW 100kHz
*SWP 100sec


ATTEN 40dB
RL 30.0dBm
10dB/
MKR -33.17dBm
23.97GHz
CCT TELECOM
MD761 H/S H.C.
MKR
23.97 GHz
-33.17 dBm
START 3.00GHz
STOP 25.00GHz
*RBW 100kHz
VBW 100kHz
*SWP 300sec