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: NC8MD220

This Report Concerns:	**Equipment Type:**
☒ Original Report	Digital Cordless Telephone System w/ Caller ID – Base

Test Engineer:	Snell Leong
Report No.:	R0410184(B)
Report Date:	2004-11-08
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

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GENERAL INFORMATION

Product Description for Equipment Under Test (EUT)

The *CCT R & D Limited's*, FCC ID: *NC8MD220*, or the "EUT" as referred to in this report is the base part of a Digital Cordless Telephone System w/ Caller ID, which measures approximately 130mmL x 115mm W x 70mm H. The EUT is a DSS device, which operates at the frequency range of 5760.72 – 5838.41MHz, with the maximum conducted output power of 19.88dBm (97.27mW).

The EUT utilized the CCT power adapter.

** The test data gathered are from a production sample, S/N: 4000009, 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,.

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.

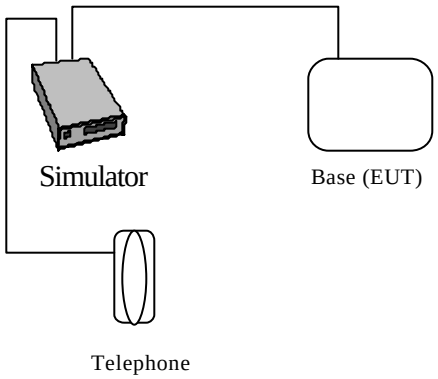
Local Support Equipment List and Details

Manufacturer	Description	Model	Serial Number	FCC ID
Southern Telecom	Telephone	None	None	None
Teltone Corp	Simulator	TLS-3B-01	80071	None

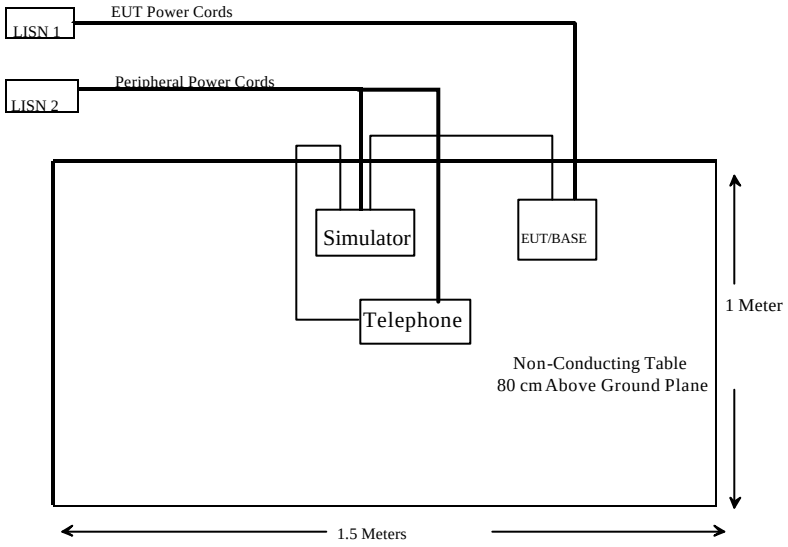
External I/O Cabling List and Details

Cable Description	Length (M)	Port/From	To
None-Shielded RJ-11 Cable	1.5	RJ-11 Port/EUT	Simulator RJ11Port
None-Shielded RJ-11 Cable	1.5	Support telephone	Simulator RJ11Port

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	Within Measurement Uncertainty
§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.

§15.207(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 $\pm$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 EUT 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	2004-09-15
Fluke	Calibrated Voltmeter	189	18485-38	2004-07-18

*** Statement of Traceability: BACL Corp.** attests that all calibrations have been performed per the NVLAP requirements, traceable to the 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:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

**The testing was performed by Snell Leong on 2004-10-27.*

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:

-28.8 dB at **2.87 MHz** in the **Line** 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
2.870	23.4	QP	Line	60.00	-28.8
0.935	29.2	QP	Neutral	56.00	-30.8
0.600	18.3	QP	Line	56.00	-31.5
0.600	2.40	Ave	Line	46.00	-35.8
6.100	34.4	QP	Line	56.00	-36.7
2.700	24.4	QP	Neutral	60.00	-37.2
0.935	4.80	Ave	Neutral	46.00	-40.8
6.100	17.1	Ave	Line	46.00	-42.9
1.350	21.1	QP	Neutral	66.00	-44.3
2.700	19.6	Ave	Neutral	50.00	-44.9
2.870	12.2	Ave	Line	50.00	-45.5
1.350	6.60	Ave	Neutral	56.00	-51.8

Plot of Conducted Emissions Test Data

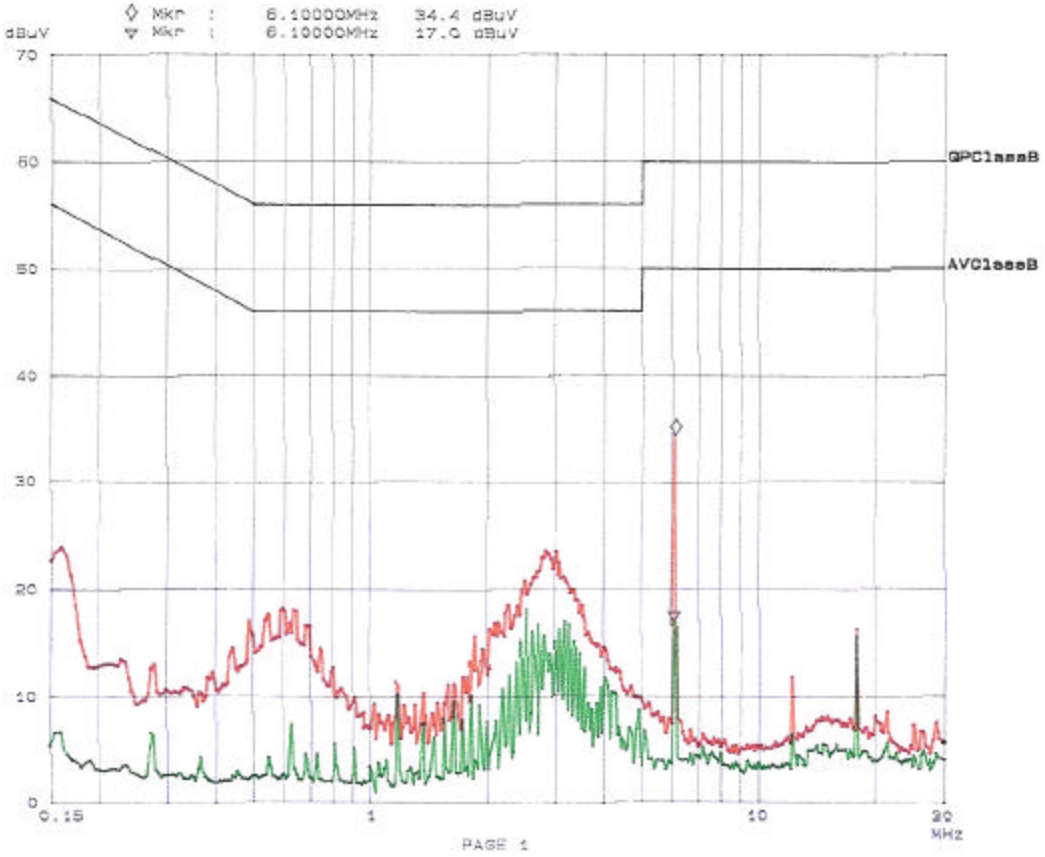
Plot(s) of Conducted Emissions Test Data is presented in the following page as reference.

Bay Area Compliance Laboratory Corp 23. Nov 04 08:10
Class B

EUT: MD220 / MD 223
Manuf: 2.4/5.8 GHz CordlessPhon (CCT)
Op Cond: Normal
Operator: Shell
Comment: N

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

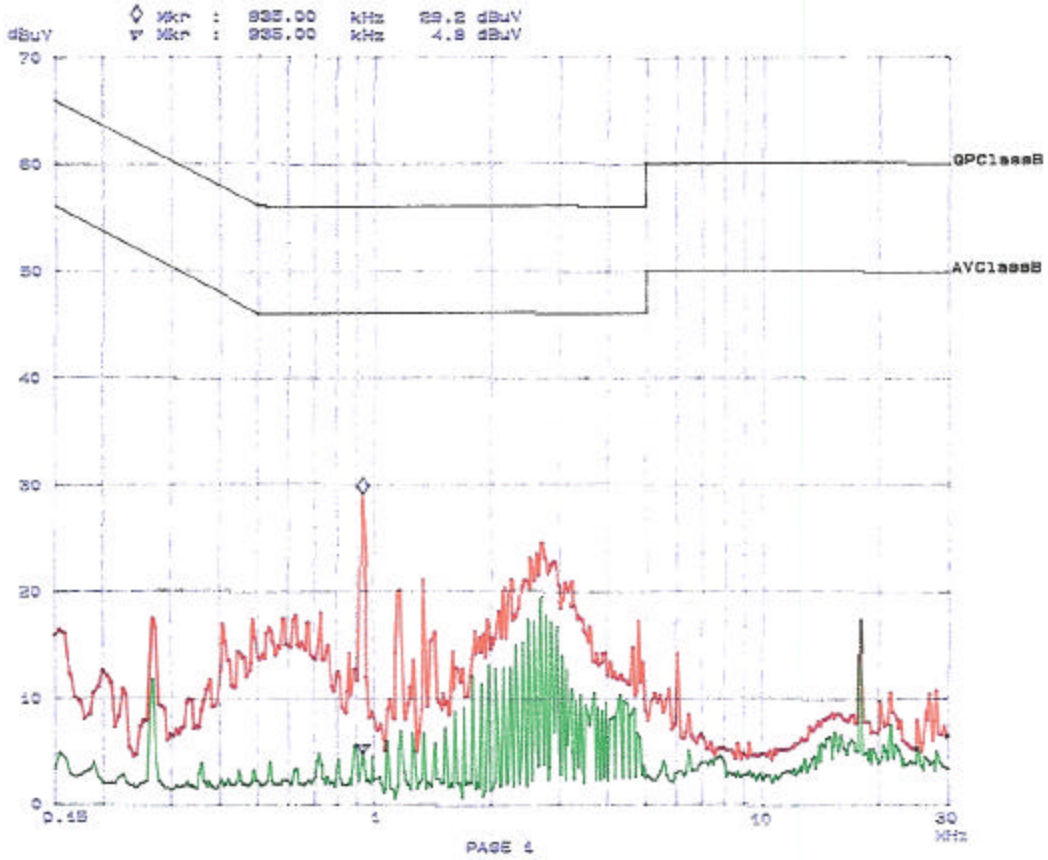


Bay Area Compliance Laboratory Corp 23. Nov 04 08:42
Class B

EUT: MD220 / MD 223
Manuf: 2.4/5.8 GHz CordlessPhon (DST)
Op Cond: Normal
Operator: Shell
Comment: L

Scan Settings (3 Ranges)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	1M	8k	9k	QP+AV	20ms	15dBLN	OFF
1M	5M	10k	9k	QP+AV	1ms	15dBLN	OFF
5M	30M	100k	9k	QP+AV	1ms	15dBLN	OFF



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Shell

§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 ±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 EUT 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 40GHz.

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. Date
HP	Amplifier, Pre, microwave	8449B	3147A00400	2004-06-14
HP	Amplifier, Pre	8447E	1937A01057	2004-08-04
Agilent	Analyzer, Spectrum	8564E	3943A01781	2004-10-04
Agilent	Analyzer, Spectrum	E4448A	1030645	2004-10-04
ETS	Antenna, Biconical	3110B	9603-2315	2004-01-11
A. H. Systems	Antenna, Horn, DRG	SAS-200/571	2455-261	2004-08-01
EMCO	Antenna, logperiodic	3146	2101	2003-11-08

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

**The testing was performed by Snell Leong on 2004-10-27.*

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 the EUT measured -0.2dB margin, within the measurement uncertainty of ±4.0dB, and had the worst margin of:

-0.8 dB at **5995.8 MHz** in the **Horizontal** polarization, Low Channel, 3 meters

-0.7 dB at **5996.5 MHz** in the **Vertical** polarization, Middle Channel, 3 meters

-0.2 dB at **5878.07 MHz** in the **Horizontal** polarization, High Channel, 3 meters

-8.8 dB at **157.67 MHz** in the **Horizontal** polarization, Unintentional Emission, 3 meters

3 Meters Radiated Emission Test Data

Indicated			Antenna	Antenna		Correction Factor			FCC 15.247		
Freqency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin	Comments
MHz	dBμV/m	Degree	Meter	H/V	dBm	dBm	dB	dBμV/m	dBμV/m	dB	
Low Channel											
5760.7200	78.0	90	3.5	v	34.1	0.9	34.5	113.0			Fund/Peak
5760.7200	73.5	0	1.5	h	34.1	0.9	34.5	108.5			Fund/Peak
5995.8000	15.7	200	3.1	h	34.1	3.4	34.5	53.2	54	-0.8	Ave
5877.5000	15.5	120	2.0	v	34.1	3.4	34.5	53.0	54	-1.0	Ave
5877.5000	15.5	45	2.0	h	34.1	3.4	34.5	53.0	54	-1.0	Ave
5995.8000	15.5	120	1.5	v	34.1	3.4	34.5	53.0	54	-1.0	Ave
5877.5000	30.1	350	2.0	v	34.1	3.4	34.5	67.6	74	-6.4	Peak
5995.8000	29.4	120	1.5	v	34.1	3.4	34.5	66.9	74	-7.1	Peak
5877.5000	28.8	45	2.0	h	34.1	3.4	34.5	66.3	74	-7.7	Peak
5995.8000	27.6	200	3.1	h	34.1	3.4	34.5	65.1	74	-8.9	Peak
Middle Channel											
5799.0700	85.6	90	2.1	v	34.1	0.9	34.5	120.6			Fund/Peak
5799.0700	76.4	180	3.0	h	34.1	0.9	34.5	111.4			Fund/Peak
5996.5000	15.8	100	2.0	v	34.1	3.4	34.5	53.3	54	-0.7	Ave
5878.0300	15.6	330	3.8	v	34.1	3.4	34.5	53.1	54	-0.9	Ave
5996.5000	15.5	0	1.5	h	34.1	3.4	34.5	53.0	54	-1.0	Ave
5878.0300	15.2	0	1.5	h	34.1	3.4	34.5	52.7	54	-1.3	Ave
5878.0300	30.4	330	3.8	v	34.1	3.4	34.5	67.9	74	-6.1	Peak
5996.5000	28.8	100	2.0	v	34.1	3.4	34.5	66.3	74	-7.7	Peak
5878.0300	28.3	0	1.5	h	34.1	3.4	34.5	65.8	74	-8.2	Peak
5996.5000	27.6	0	1.5	h	34.1	3.4	34.5	65.1	74	-8.9	Peak
High Channel											
5838.4100	81.9	0	2.8	v	34.1	0.9	34.5	116.9			Fund/Peak
5838.4100	74.0	90	1.2	h	34.1	0.9	34.5	109.0			Fund/Peak
5878.0700	16.3	0	1.5	h	34.1	3.4	34.5	53.8	54	-0.2	Ave
5917.8000	16.3	0	1.5	h	34.1	3.4	34.5	53.8	54	-0.2	Ave
5878.0700	16.1	90	3.0	v	34.1	3.4	34.5	53.6	54	-0.4	Ave
5917.8000	15.8	0	2.5	v	34.1	3.4	34.5	53.3	54	-0.7	Ave
5708.50	15.47	120	2.0	v	34.1	3.4	34.5	53.0	54	-1.0	Ave
5708.50	15.27	0	3.0	h	34.1	3.4	34.5	52.8	54	-1.2	Ave
5878.0700	31.6	90	3.0	v	34.1	3.4	34.5	69.1	74	-4.9	Peak
5917.8000	30.5	0	2.5	v	34.1	3.4	34.5	68.0	74	-6.0	Peak
5917.8000	29.1	0	1.5	h	34.1	3.4	34.5	66.6	74	-7.4	Peak
5878.0700	28.7	0	1.5	h	34.1	3.4	34.5	66.2	74	-7.8	Peak
5708.50	28.27	120	2.0	v	34.1	3.4	34.5	65.8	74	-8.2	Peak
5708.50	26.57	0	3.0	h	34.1	3.4	34.5	64.1	74	-9.9	Peak

Note:

FUND: Fundemental
AVG: Average

Unintentional Emission

Indicated			Antenna	Antenna		Correction Factor			FCC 15.247	
Frequency	Ampl.	Direction	Height	Polar	Antenna	Cable Loss	Amp.	Corr. Ampl.	Limit	Margin
MHz	dBµV/m	Degree	Meter	H/V	dBm	dBm	dB	dBµV/m	dBµV/m	dB
157.67	48.13	345	1.7	H	12.8	1.7	28.4	34.2	43	-8.8 Peak
760.87	39.68	350	2.6	V	22.6	2.6	28.8	36.1	46	-9.9 Peak
918.57	36.89	350	3.0	V	23.2	3.9	28.4	35.7	46	-10.3 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	Calibration Date
Agilent	E4448A	Spectrum Analyzer	2004-10-04

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

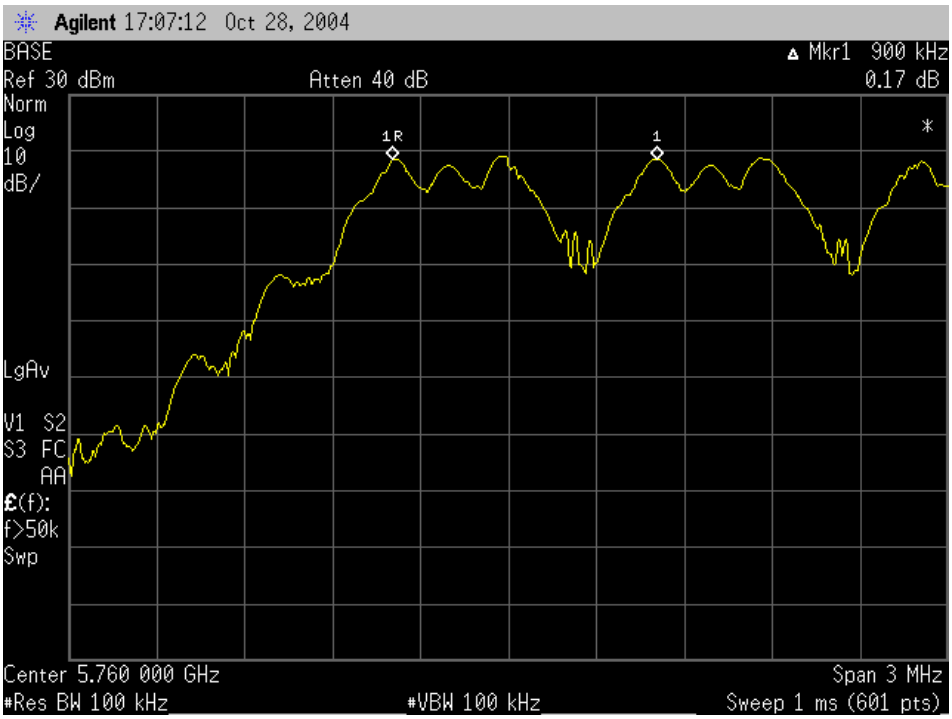
**The testing was performed by Snell Leong on 2004-10-28.*

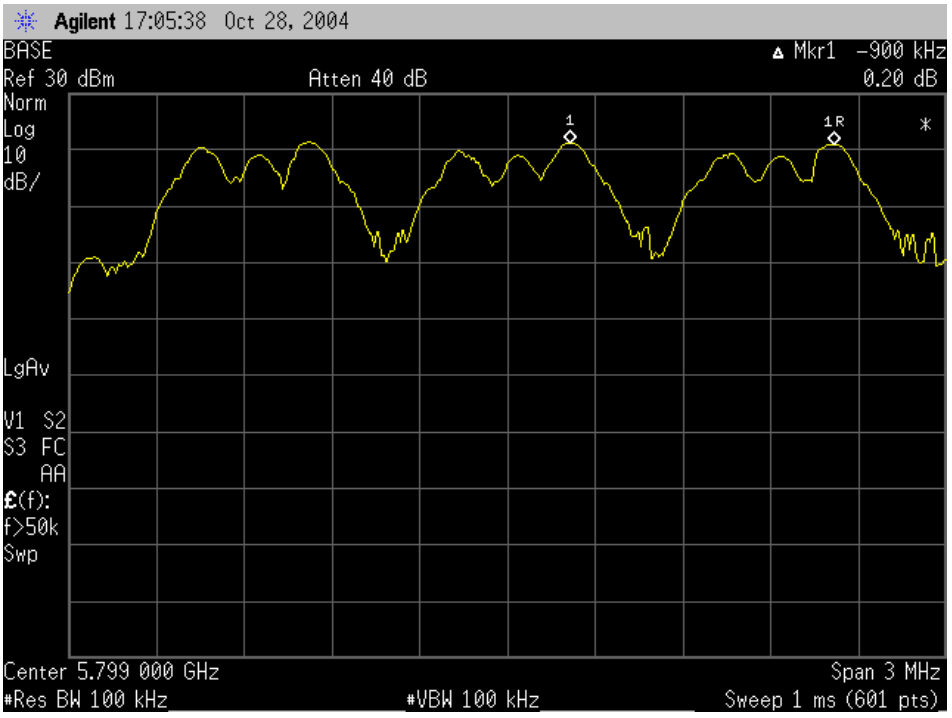
Measurement Results

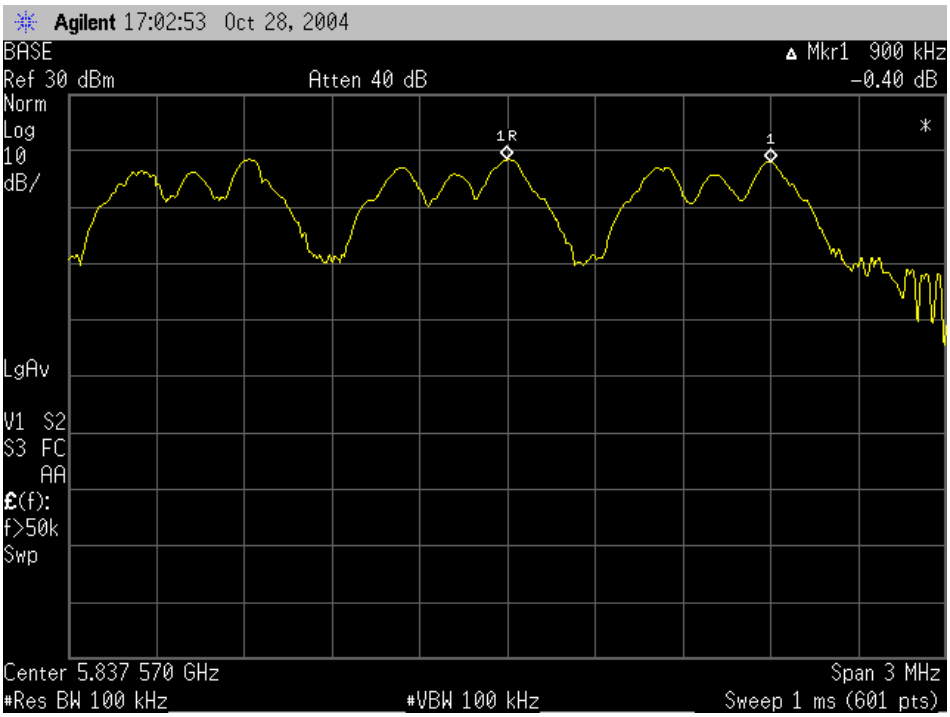
Channel	Measurement (KHz)	Result
Low	900	Compliant
Middle	900	Compliant
High	900	Compliant

Plots of Hopping Channel Separation

Please see the following plots






Agilent 17:02:53 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 900 kHz
-0.40 dB
Norm
Log
10
dB/
1R
1
LgAv
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 5.837 570 GHz
Span 3 MHz
#Res BW 100 kHz
#VBW 100 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.	Serial No.	Calibration Date
Agilent	E4448A	Spectrum Analyzer	2004-10-04

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

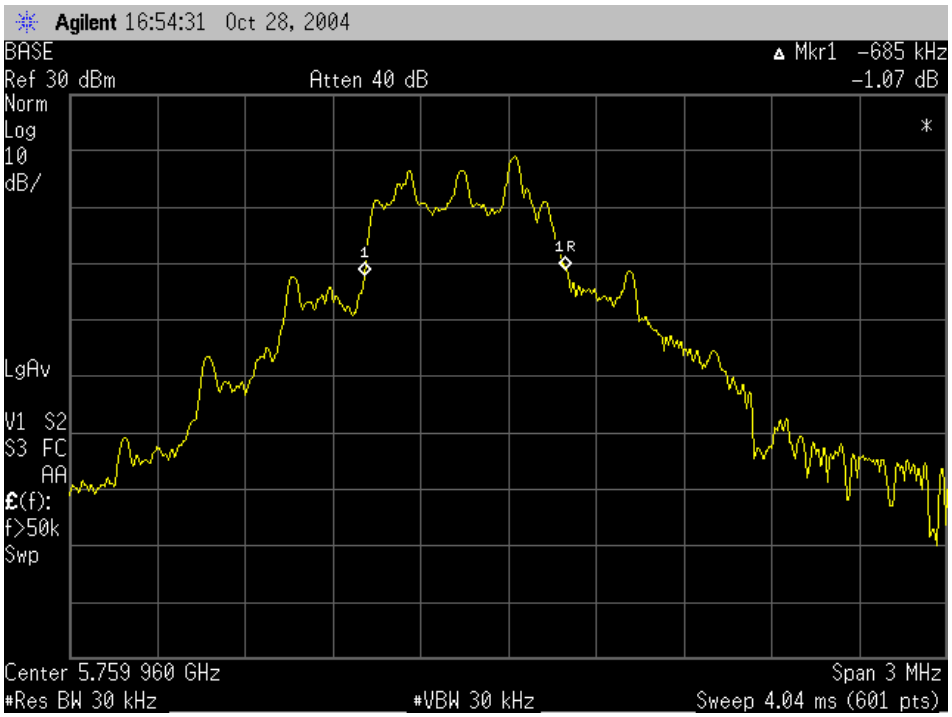
**The testing was performed by Snell Leong on 2004-10-28.*

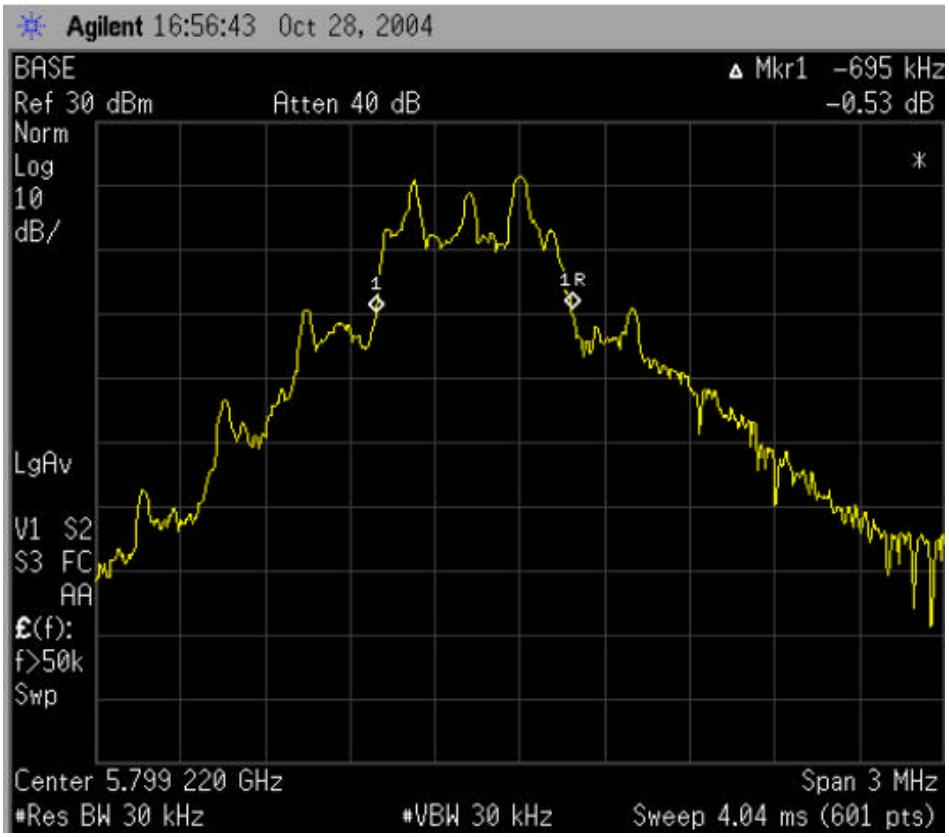
Measurement Result

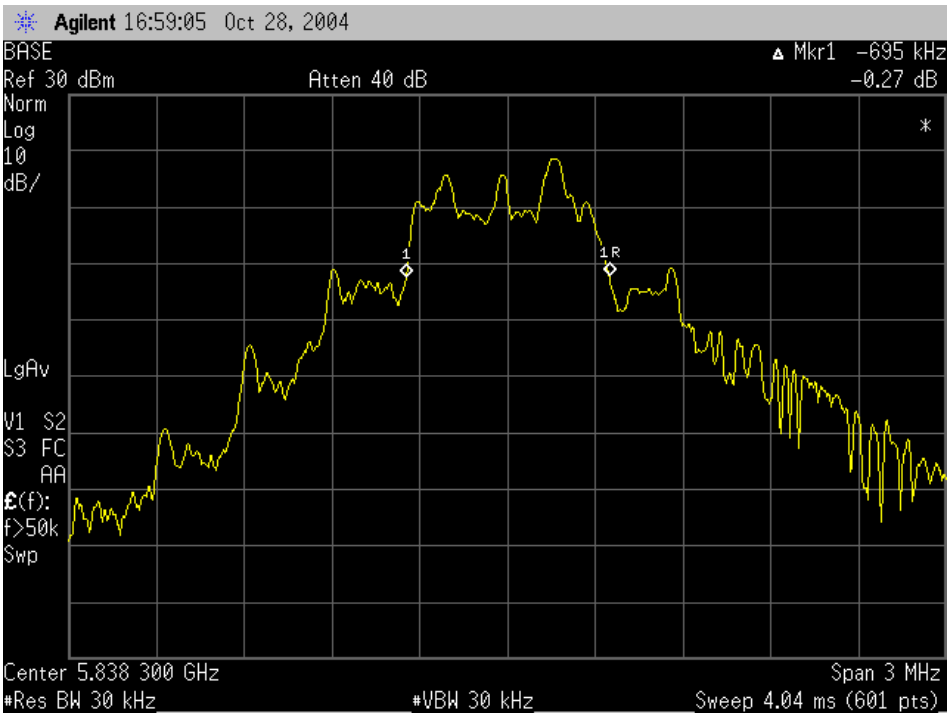
Frequency	Measurement (kHz)	Standard	Result
Low	685	≤ 1MHz	Compliant
Middle	695	≤ 1MHz	Compliant
High	695	≤ 1MHz	Compliant

Plot of Channel Bandwidth

Please see the following plots


Agilent 16:54:31 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 -685 kHz
-1.07 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 5.759 960 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 30 kHz
Sweep 4.04 ms (601 pts)


Agilent 16:56:43 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 -695 kHz
-0.53 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 5.799 220 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 30 kHz
Sweep 4.04 ms (601 pts)


Agilent 16:59:05 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 -695 kHz
-0.27 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Center 5.838 300 GHz
Span 3 MHz
#Res BW 30 kHz
#VBW 30 kHz
Sweep 4.04 ms (601 pts)

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

Standard Applicable

According to §15.247(a)(1)(ii), frequency hopping systems operating in the 5725-5850MHz 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	E4448A	Spectrum Analyzer	2004-10-04

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

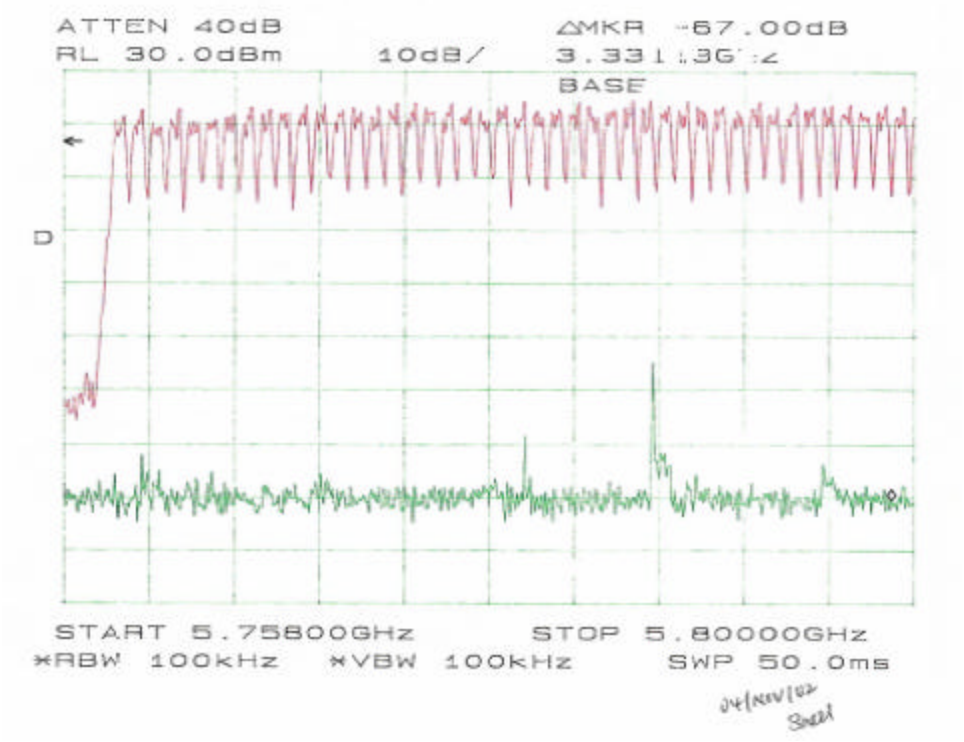
**The testing was performed by Snell Leong on 2004-11-02.*

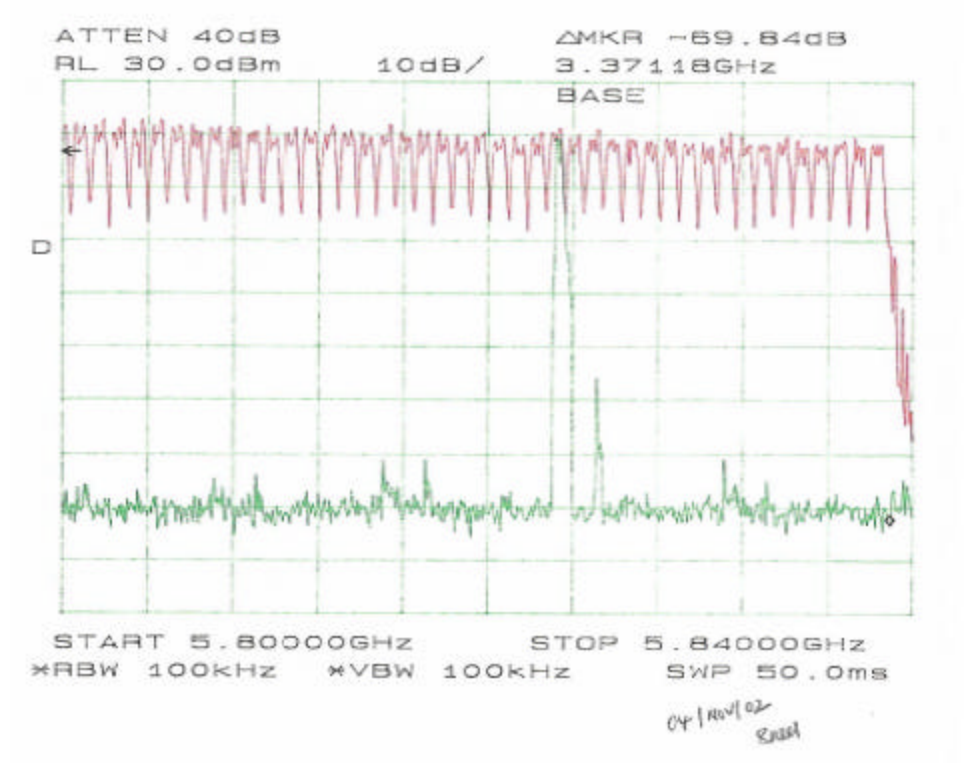
Measurement Results

Measurement	Standard	Result
88	75	Compliant

Plots of Number of Hopping Frequency

Please refer to the following plots.


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -67.00dB
BASE
D
START 5.75800GHz
STOP 5.80000GHz
*RBW 100kHz
*VBW 100kHz
SWP 50.0ms


ATTEN 40dB
RL 30.0dBm
10dB/
ΔMKR -69.84dB
3.37118GHz
BASE
D
START 5.80000GHz
STOP 5.84000GHz
*RBW 100kHz
*VBW 100kHz
SWP 50.0ms

§15.247 9 (a) (1) (iii) - DWELL TIME

Standard Applicable

According to §15.247 (a)(1)(ii), 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	E4448A	Spectrum Analyzer	2004-10-04

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

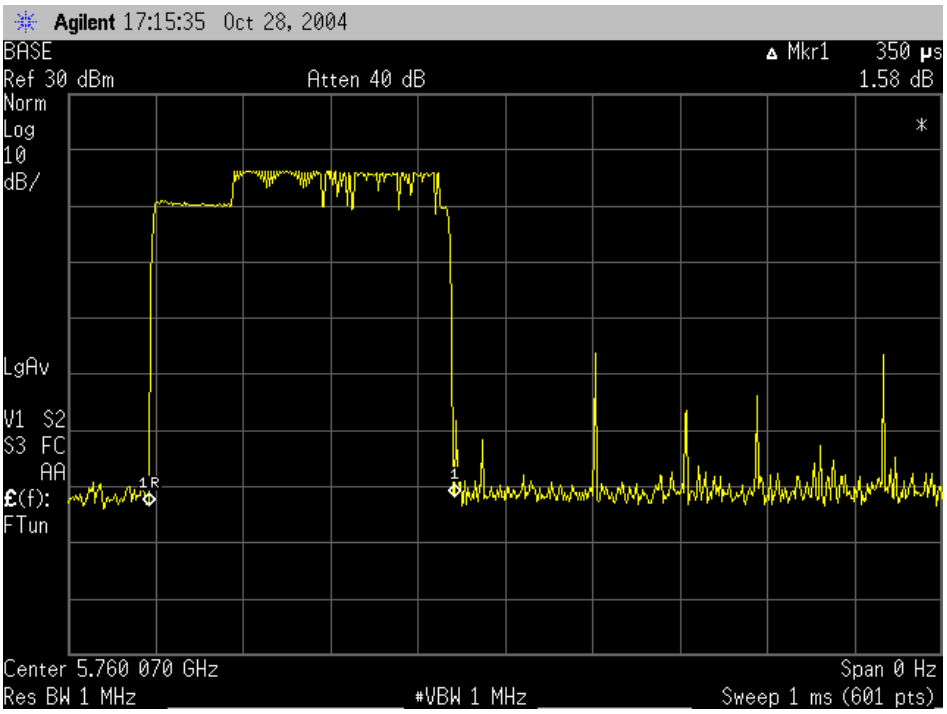
**The testing was performed by Snell Leong on 2004-10-28.*

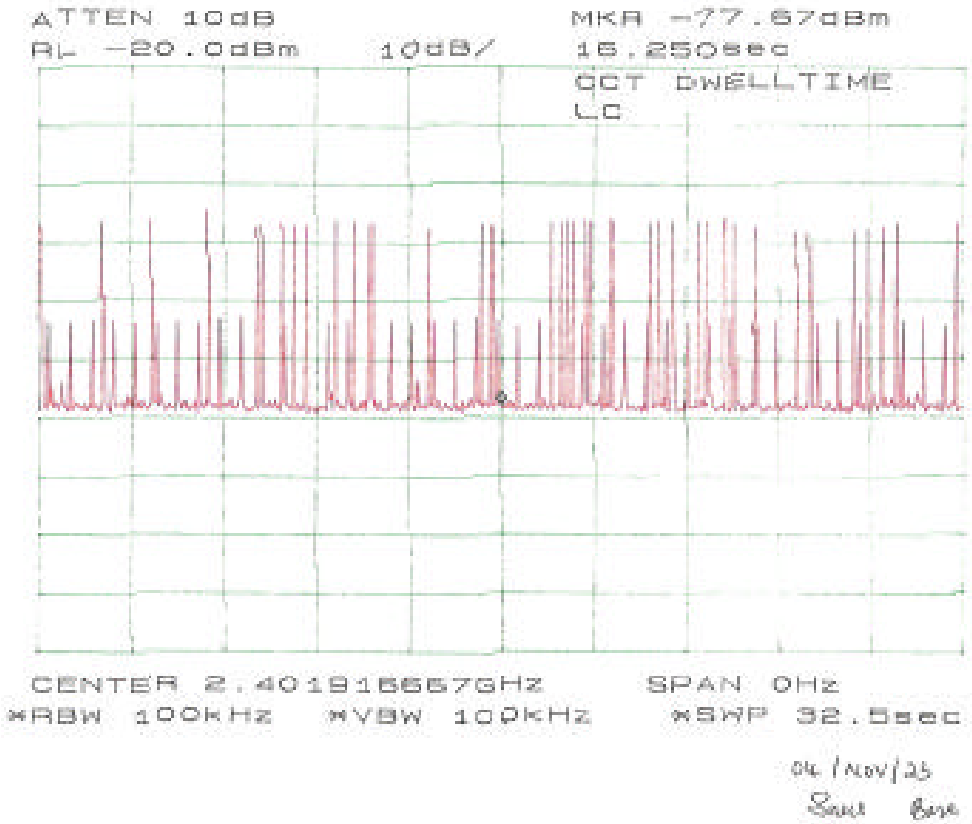
Measurement Results

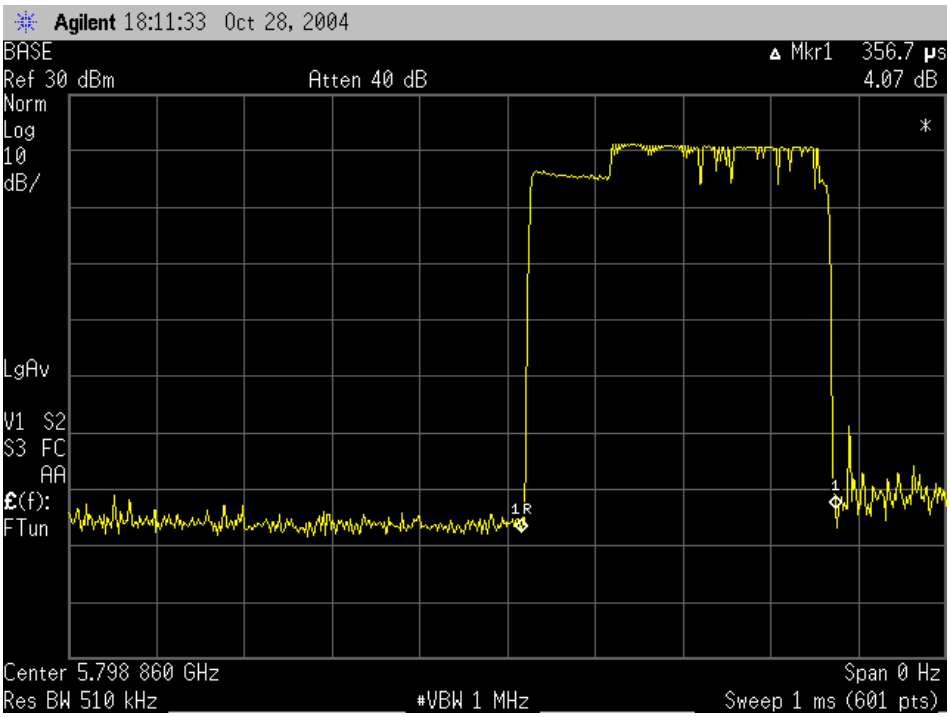
Channel	Frequency MHz	Pulse Wide uSec	Occupied time per 0.4 * 88 sec	Dwell Time Sec	Limit Sec
Low	5760.72	350	42	0.0147	0.4
Mid	5798.86	353.3	42	0.0148	0.4
High	5838.458	353	43	0.0152	0.4

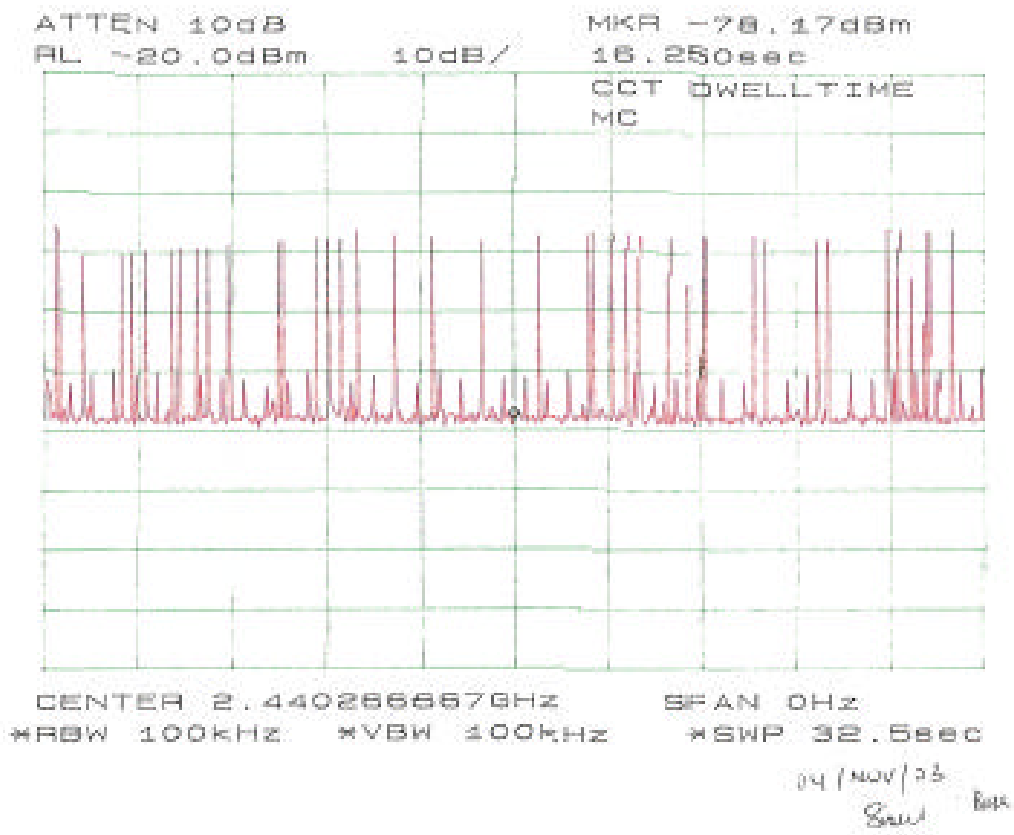
Low Channel Dwell Time = 350x4/3x88x0.4 = 14.7 Msec
Mid Channel Dwell Time = 353.3x4/3x88x0.4 = 14.8386 Msec
High Channel Dwell Time = 353x4/3x88x0.4 = 15.179 Msec

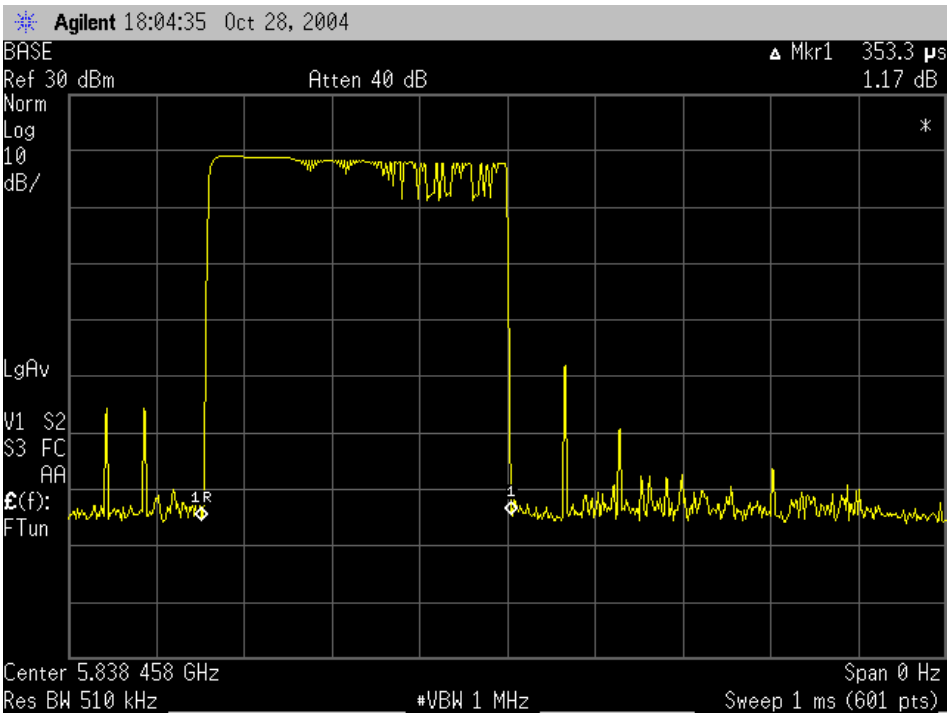
Plots of Dwell Time
Please refer the following plots.

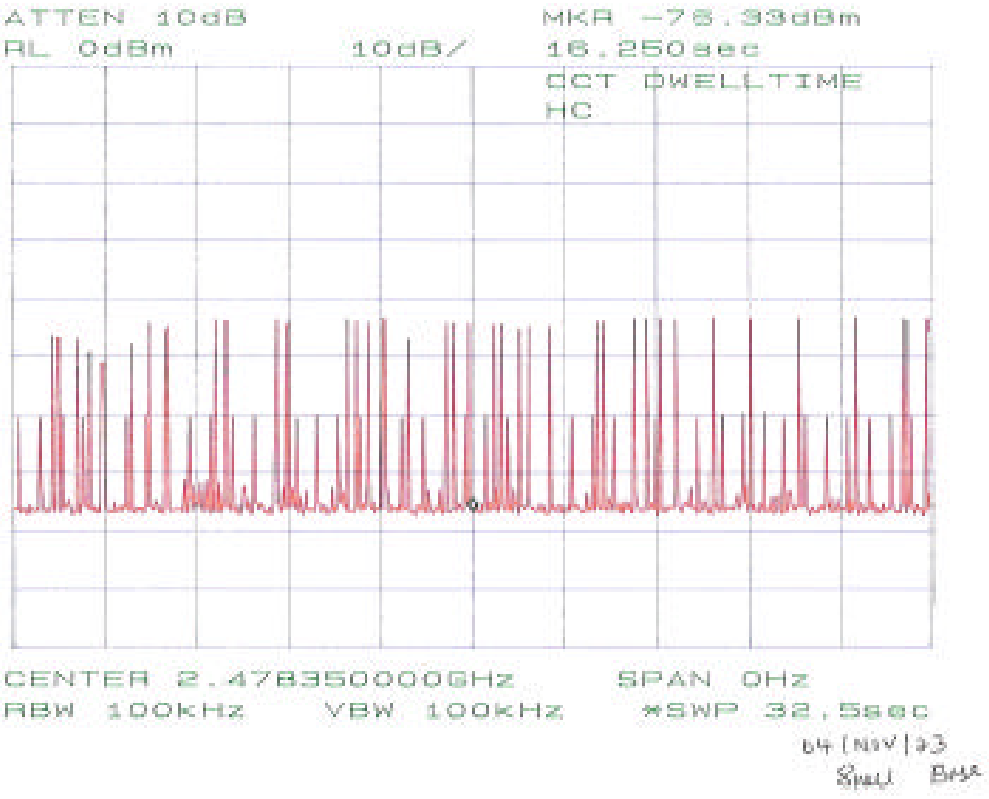

Agilent 17:15:35 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 350 µs
1.58 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 5.760 070 GHz
Res BW 1 MHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 ms (601 pts)


ATTEN 10dB
RL -20.0dBm
10dB/
MKR -77.67dBm
16.250sec
CCT DWELLTIME
LC
CENTER 2.401916667GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 32.5sec
04/Nov/25


Agilent 18:11:33 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 356.7 µs
4.07 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 5.798 860 GHz
Res BW 510 kHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 ms (601 pts)


ATTEN 10dB
RL -20.0dBm
10dB/
MKR -78.17dBm
16.250sec
CCT DWELLTIME
MC
CENTER 2.440266667GHz
SPAN 0Hz
*RBW 100kHz
*VBW 100kHz
*SWP 32.5sec
04/NOV/25


Agilent 18:04:35 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 353.3 µs
1.17 dB
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Center 5.838 458 GHz
Res BW 510 kHz
#VBW 1 MHz
Span 0 Hz
Sweep 1 ms (601 pts)


ATTEN 10dB
RL 0dBm
10dB/
MKR -78.33dBm
16.250sec
CCT DWELLTIME
HC
CENTER 2.47835000GHz
SPAN 0Hz
RBW 100kHz
VBW 100kHz
*SWP 32.5sec
b4 (NIV) 23
Small Base

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

Standard Applicable

According to §15.247(b) (1), for all frequency hopping systems in the 5725-5850 MHz band, 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	E4448A	Spectrum Analyzer	2004-10-04

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

Environmental Conditions

Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

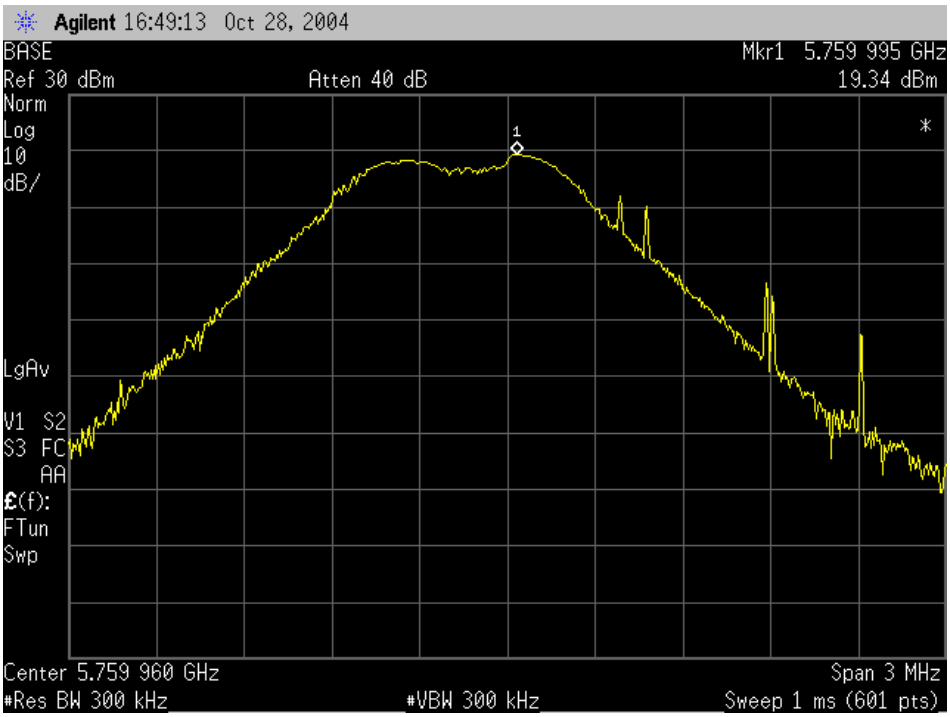
**The testing was performed by Snell Leong on 2004-10-29.*

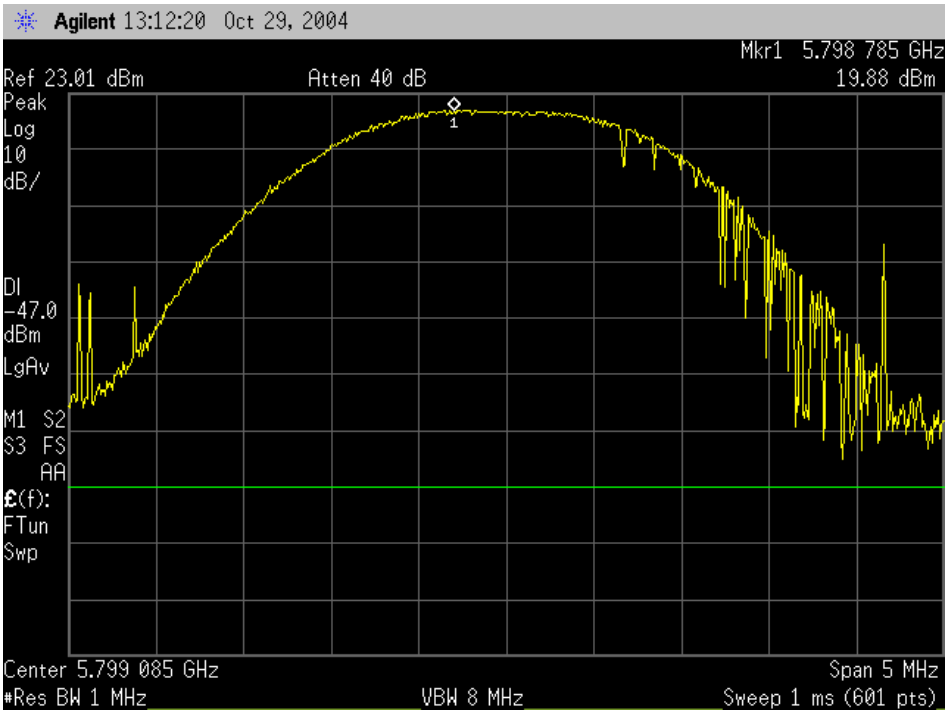
Measurement Result

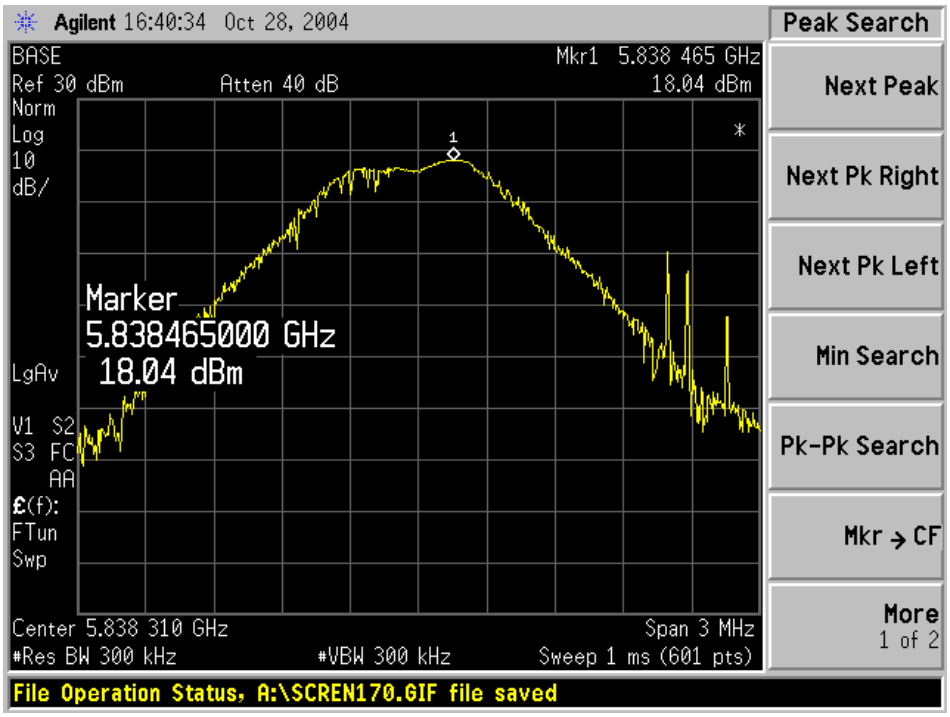
Channel	Frequency (MHz)	Max Peak Output Power (dBm)	(W)	Standard	Result
Low	5760.720	19.34	0.08590	≤ 1W	Compliant
Middle	5799.960	19.88	0.09727	≤ 1W	Compliant
High	5838.458	18.04	0.06266	≤ 1W	Compliant

Plots of Maximum Peak Output Power

Please refer to following plots.


Agilent 16:49:13 Oct 28, 2004
BASE
Ref 30 dBm
Atten 40 dB
Mkr1 5.759 995 GHz
19.34 dBm
Norm
Log
10
dB/
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 5.759 960 GHz
#Res BW 300 kHz
#VBW 300 kHz
Span 3 MHz
Sweep 1 ms (601 pts)


Agilent 13:12:20 Oct 29, 2004
Mkr1 5.798 785 GHz
Ref 23.01 dBm
Atten 40 dB
19.88 dBm
Peak
Log
10
dB/
Dl
-47.0
dBm
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Center 5.799 085 GHz
#Res BW 1 MHz
VBW 8 MHz
Span 5 MHz
Sweep 1 ms (601 pts)


Agilent 16:40:34 Oct 28, 2004
Peak Search
BASE
Mkr1 5.838 465 GHz
Ref 30 dBm
Atten 40 dB
18.04 dBm
Norm
Log
10
dB/
Next Peak
Next Pk Right
Next Pk Left
Min Search
Pk-Pk Search
Mkr → CF
More
1 of 2
Marker
5.838465000 GHz
18.04 dBm
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
Swp
Center 5.838 310 GHz
Span 3 MHz
#Res BW 300 kHz
#VBW 300 kHz
Sweep 1 ms (601 pts)
File Operation Status, A:\SCREN170.GIF file saved

§15.247 (b)(4) - 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 Maximum Permissive Exposure (MPE)

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
1500-15000	/	/	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

Maximum peak output power at antenna input terminal: 19.88 (dBm)
Maximum peak output power at antenna input terminal: 97.27 (mW)
Prediction distance: 20 (cm)
Predication frequency: 5800 (MHz)
Antenna Gain (typical): 0 (dBi)
Maximum antenna gain: 1(numeric)
Power density at predication frequency at 20 cm: 0.019(mW/cm^2)
MPE limit for uncontrolled exposure at prediction frequency: 1.0 (mW/cm^2)

Test Result

The predicted power density level at 20 cm is 0.019 mW/cm^2. This is below the uncontrolled exposure limit of 1mW/cm^2 at 5800 MHz. The EUT is used at least 20cm away from user's body. It is determined as mobile equipment.

§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	E4448A	Spectrum Analyzer	2004-10-04

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

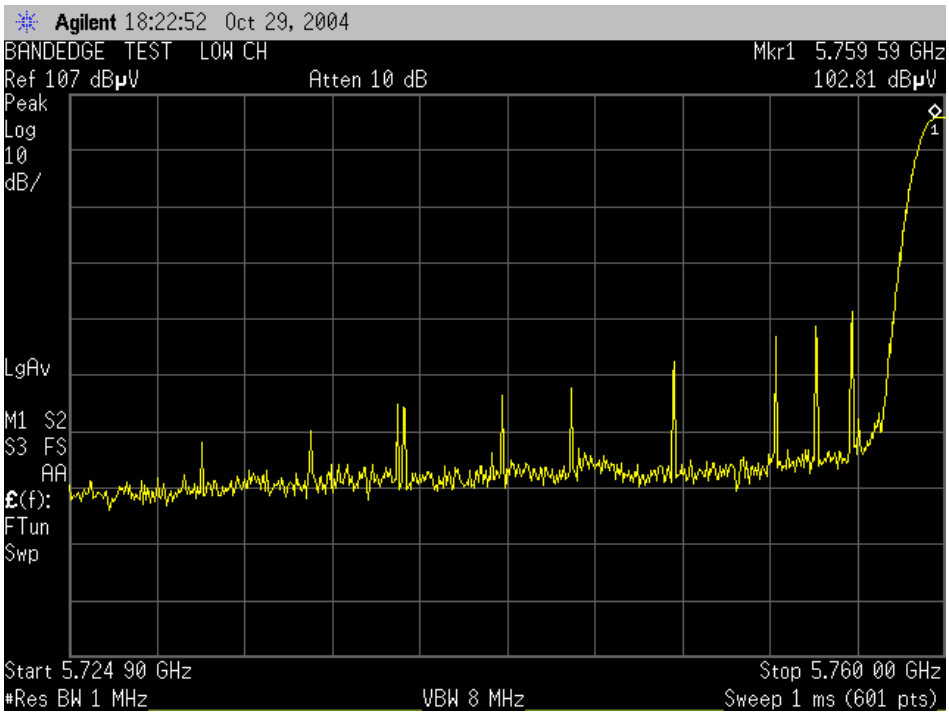
Environmental Conditions

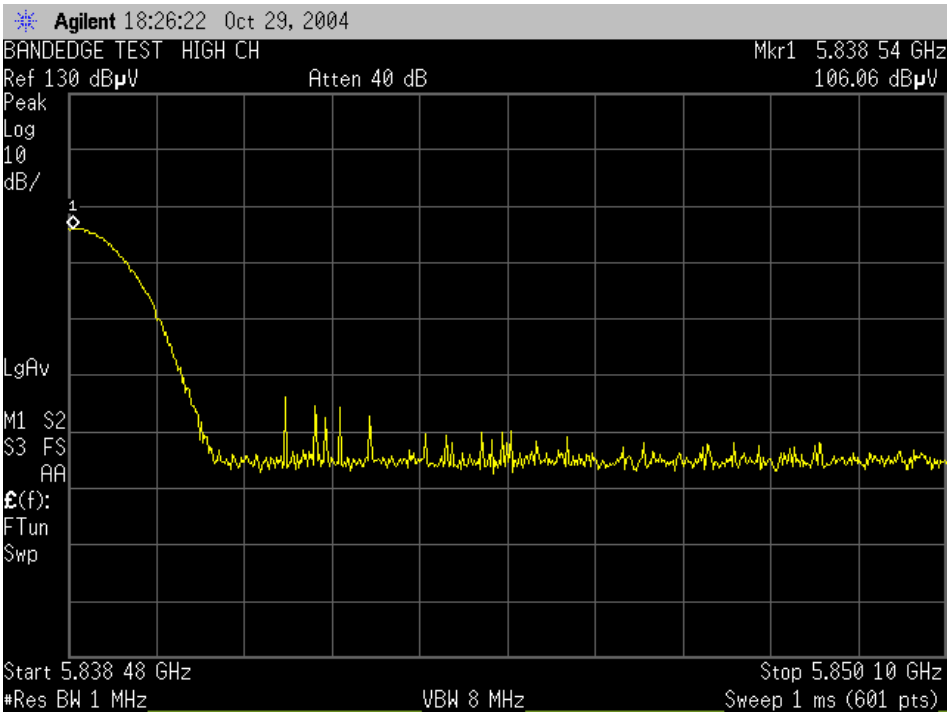
Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

**The testing was performed by Snell Leong on 2004-10-29.*

Plots of 100kHz Bandwidth of Band Edge

Please refer the following plots.


Agilent 18:22:52 Oct 29, 2004
BANDEDGE TEST LOW CH
Mkr1 5.759 59 GHz
Ref 107 dBµV
Atten 10 dB
102.81 dBµV
Peak
Log
10
dB/
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 5.724 90 GHz
Stop 5.760 00 GHz
#Res BW 1 MHz
VBW 8 MHz
Sweep 1 ms (601 pts)


Agilent 18:26:22 Oct 29, 2004
BANDEDGE TEST HIGH CH
Mkr1 5.838 54 GHz
Ref 130 dBµV
Atten 40 dB
106.06 dBµV
Peak
Log
10
dB/
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 5.838 48 GHz
Stop 5.850 10 GHz
#Res BW 1 MHz
VBW 8 MHz
Sweep 1 ms (601 pts)

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	E4448A	Spectrum Analyzer	2004-10-04

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

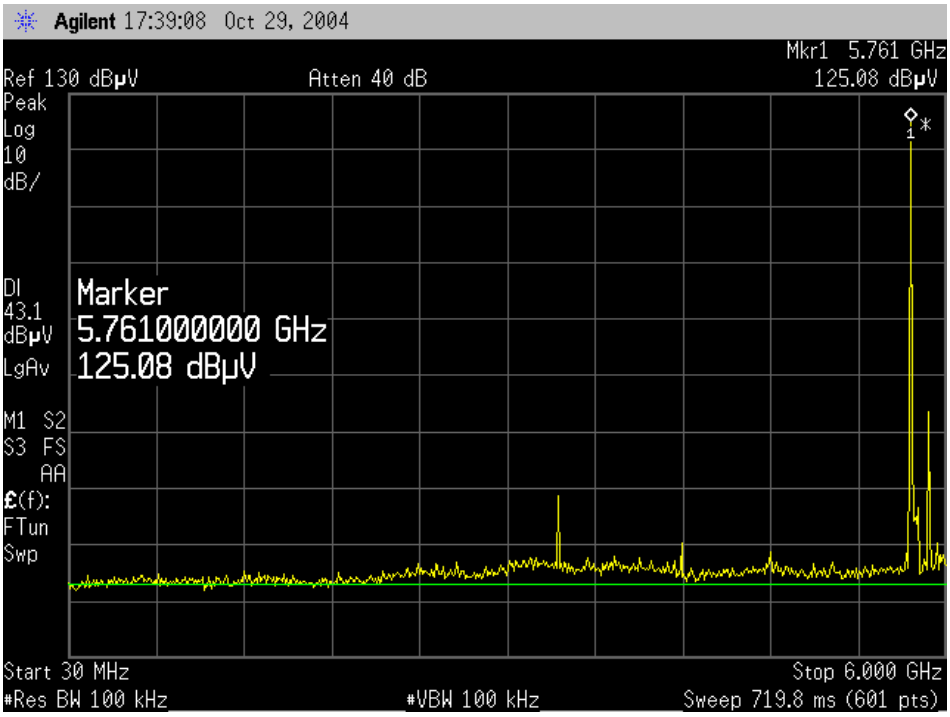
Environmental Conditions

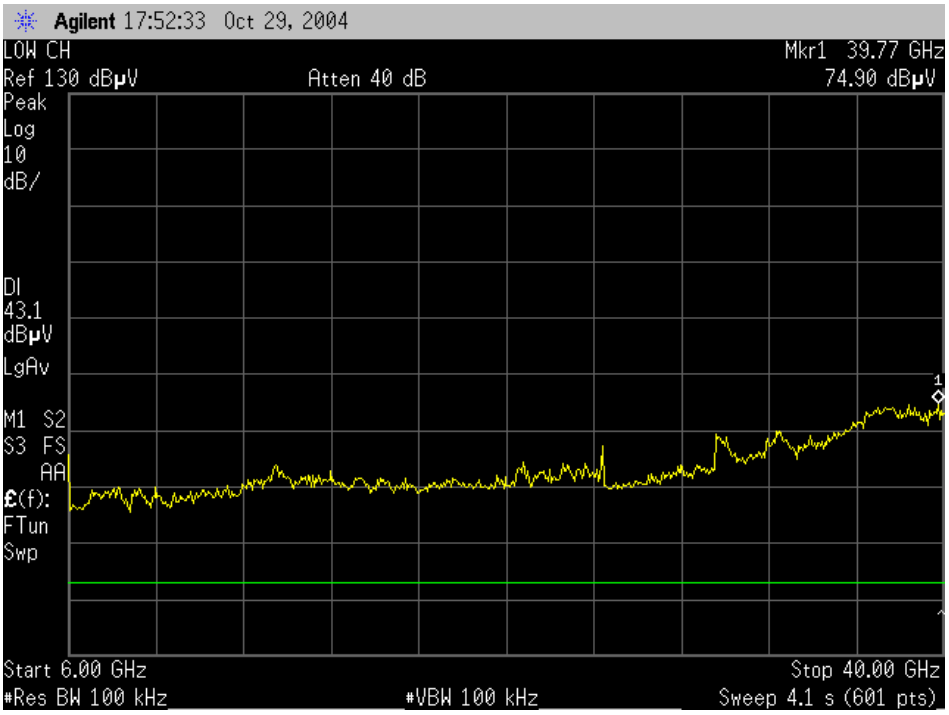
Temperature:	18° C
Relative Humidity:	43%
ATM Pressure:	1018 mbar

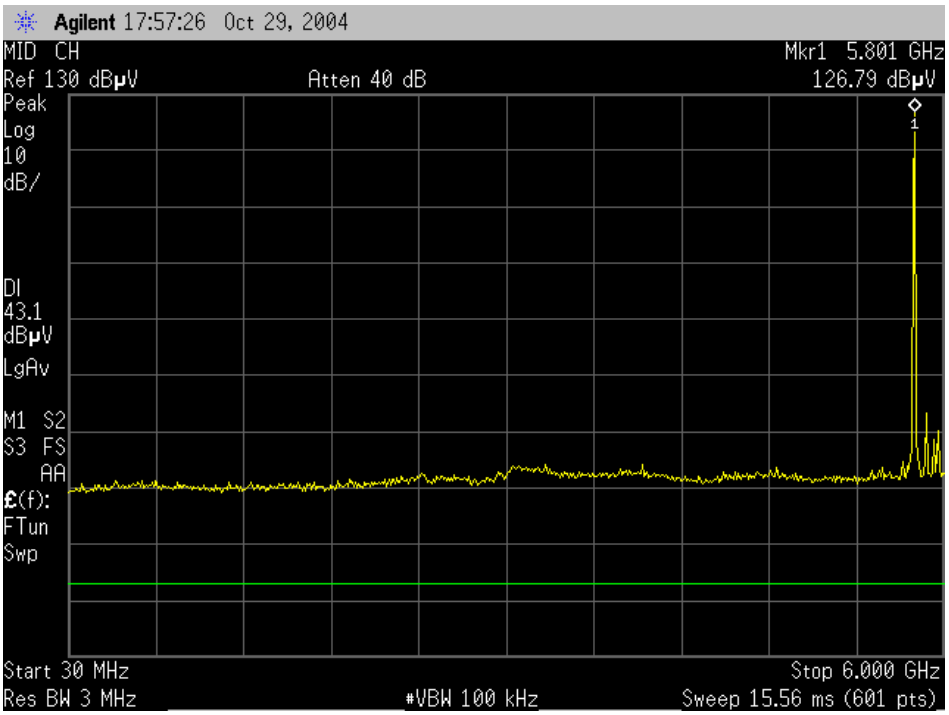
**The testing was performed by Snell Leong on 2004-10-29.*

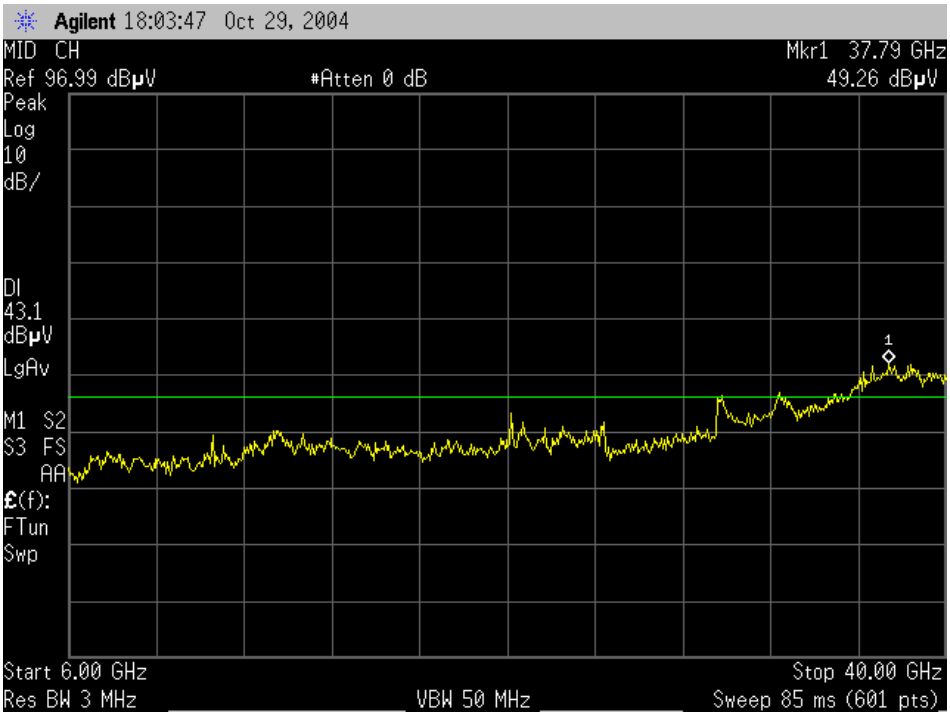
Measurement Results

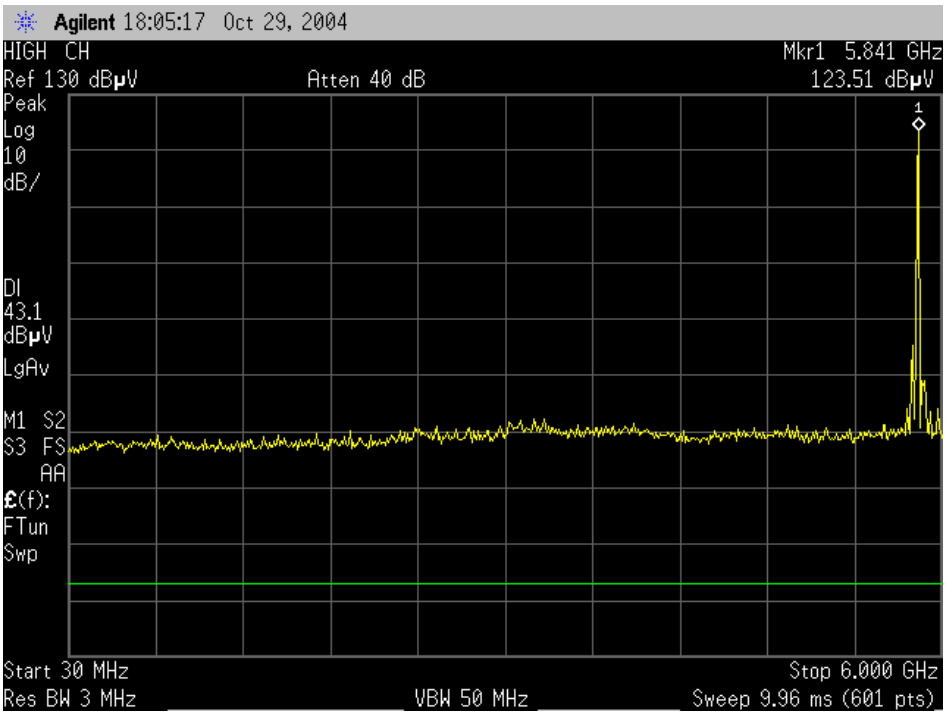
Please refer to the following plots.

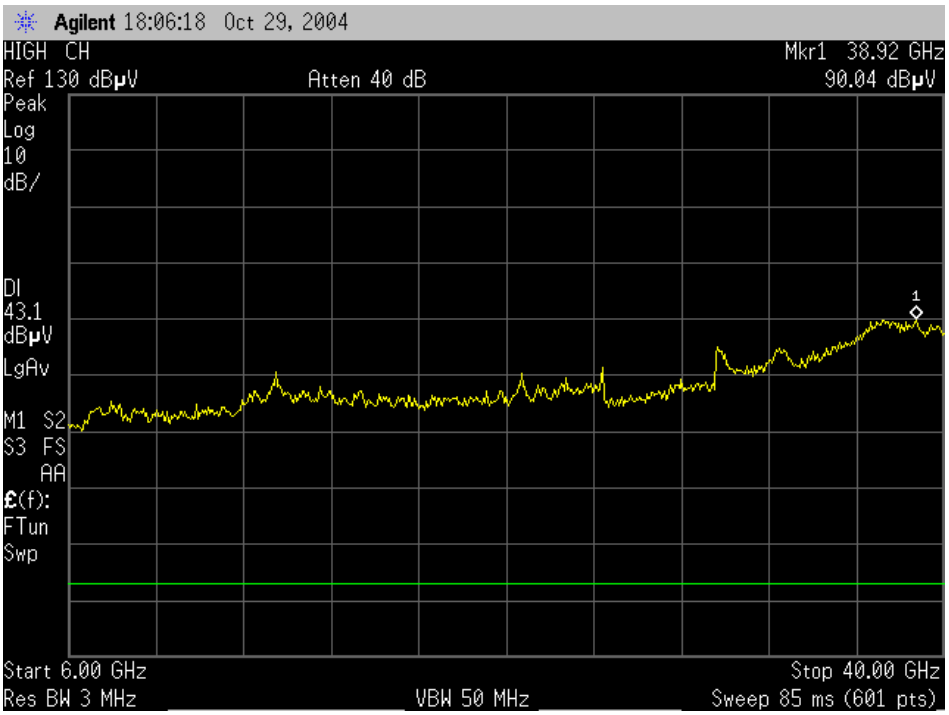

Agilent 17:39:08 Oct 29, 2004
Mkr1 5.761 GHz
Ref 130 dBµV
Atten 40 dB
125.08 dBµV
Peak
Log
10
dB/
Marker
5.761000000 GHz
125.08 dBµV
Start 30 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 6.000 GHz
Sweep 719.8 ms (601 pts)


Agilent 17:52:33 Oct 29, 2004
LOW CH
Mkr1 39.77 GHz
Ref 130 dBµV
Atten 40 dB
74.90 dBµV
Peak
Log
10
dB/
Start 6.00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 40.00 GHz
Sweep 4.1 s (601 pts)


Agilent 17:57:26 Oct 29, 2004
MID CH
Mkr1 5.801 GHz
Ref 130 dBµV
Atten 40 dB
126.79 dBµV
Peak
Log
10
dB/
DI
43.1
dBµV
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 30 MHz
Stop 6.000 GHz
Res BW 3 MHz
#VBW 100 kHz
Sweep 15.56 ms (601 pts)


Agilent 18:03:47 Oct 29, 2004
MID CH
Mkr1 37.79 GHz
Ref 96.99 dBµV
#Atten 0 dB
49.26 dBµV
Peak
Log
10
dB/
DI
43.1
dBµV
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 6.00 GHz
Stop 40.00 GHz
Res BW 3 MHz
VBW 50 MHz
Sweep 85 ms (601 pts)


Agilent 18:05:17 Oct 29, 2004
HIGH CH
Mkr1 5.841 GHz
Ref 130 dBµV
Atten 40 dB
123.51 dBµV
Peak
Log
10
dB/
DI
43.1
dBµV
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 30 MHz
Stop 6.000 GHz
Res BW 3 MHz
VBW 50 MHz
Sweep 9.96 ms (601 pts)


Agilent 18:06:18 Oct 29, 2004
HIGH CH
Mkr1 38.92 GHz
Ref 130 dBµV
Atten 40 dB
90.04 dBµV
Peak
Log
10
dB/
DI
43.1
dBµV
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 6.00 GHz
Stop 40.00 GHz
Res BW 3 MHz
VBW 50 MHz
Sweep 85 ms (601 pts)