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: NC8MD751

This Report Concerns:	**Equipment Type:**
☒ Class II Permissive Change	Digital 2.4/5.8GHz Cordless Telephone System w/ Caller ID – Base

Test Engineer:	Snell Leong
Report No.:	R0504112
Report Date:	2005-04-22
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: *NC8MD751*, model: *MD791*, or the "EUT" as referred to in this report is the base part of a Digital 2.4/5.8GHz Cordless Telephone System w/ Caller ID, which measures approximately 175mmL x 155mm W x 60mm H. The EUT is a FHSS device, which operates at the frequency range of 5760.72 – 5838.31MHz, with the maximum conducted output power of 19.41dBm (87.3mW).

** The test data gathered are from a production sample, S/N: 602VFD000Q, 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,.

This is the C2PC application. Difference between the current device and the original one is that the manufacturer modified the BSRF module to use the new PA and also slightly change the PCB layout. For details of the changes, please refer to the updated schematics.

Related Submittal(s)/Grant(s)

The original device was granted on 2004-08-13. For the original testing, please refer to BACL's testing report R0407072.

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003& TIA/EIA-603.

Test Facility

The Open Area Test site used by BACL 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 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 radiated and AC line conducted test site criteria set forth in ANSI C63.4-2003.

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 current scope of accreditations can be found at http://ts.nist.gov/ts/htdocs/210/214/scopes/2001670.htm

SYSTEM TEST CONFIGURATION

Justification

The EUT was configured for testing according to ANSI C63.4-2003.

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

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

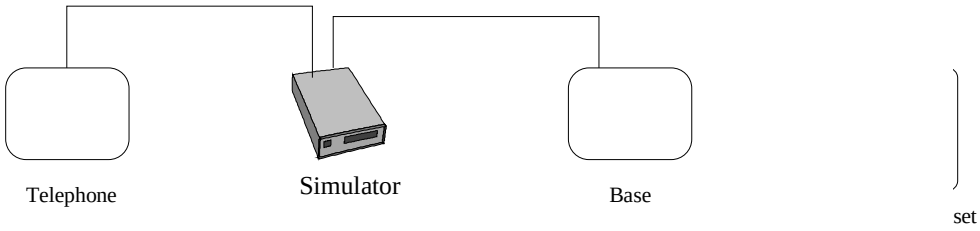
External I/O Cabling List and Details

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

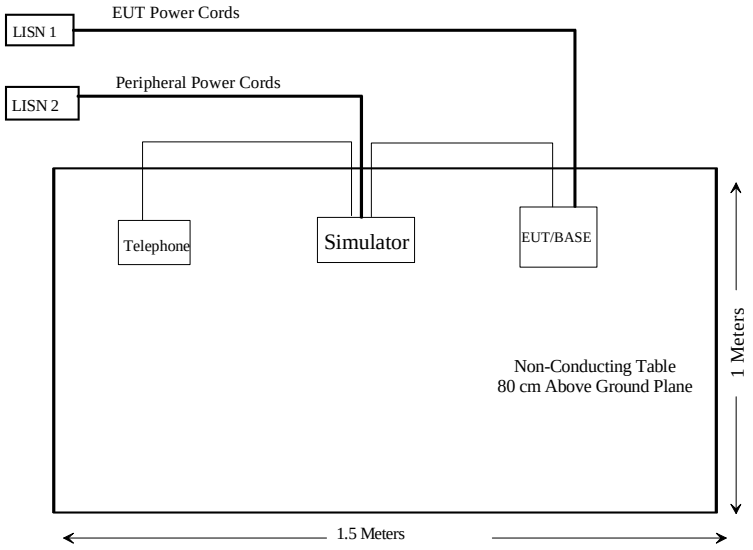
Power Supply Information

Manufacturer	Description	Model	Serial Number	FCC ID
Motorola	AC Adaptor	5864200w11	DU41090070C	None

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	Compliant
§15.207 (a)	Conducted Emission	Compliant
§15.209	Radiated Emission	Compliant
§15.247 (a) (1)	Hopping Channel Separation	Compliant
§15.247 (a) (1) (ii)	Channel Bandwidth	Compliant
§15.247 (a) (1) (ii)	Number of Hopping Frequencies Used	Compliant
§15.247 (a) (1) (ii)	Dwell Time of Each Frequency within a 30 Second Period of time	Compliant
§15.247 (b) (1)	Maximum Peak Output Power	Compliant
§ 15.247 (b)(4) § 2.1091	RF Safety Requirements	Compliant
§ 15.247 (d)	100 kHz Bandwidth of Frequency Band Edge	Compliant
§ 2.1051	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 – 2003 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
R&S	Receiver, EMI Test	ESCS30	100176	9/15/2004
R&S	LISN, Artificial Mains	ESH2-Z5	871884/039	8/16/2004

*** 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:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

**The testing was performed by Snell Leong on 2005-04-19.*

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:

-27.9 dB at **1.130 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
1.130	28.1	QP	Line	56.00	-27.9
1.120	27.1	QP	Neutral	56.00	-28.9
1.130	16.0	Ave	Line	46.00	-30.0
1.120	14.2	Ave	Neutral	46.00	-31.8
14.100	13.8	Ave	Neutral	50.00	-36.2
14.200	12.9	Ave	Line	50.00	-37.1
14.100	18.4	QP	Neutral	60.00	-41.6
0.150	23.2	QP	Neutral	66.00	-42.8
14.200	16.0	QP	Line	60.00	-44.0
0.150	20.0	QP	Line	66.00	-46.0
0.150	7.6	Ave	Neutral	56.00	-48.4
0.150	5.1	Ave	Line	56.00	-50.9

Plot of Conducted Emissions Test Data

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

Bay Area Compliance L2boratory Corp
Class B

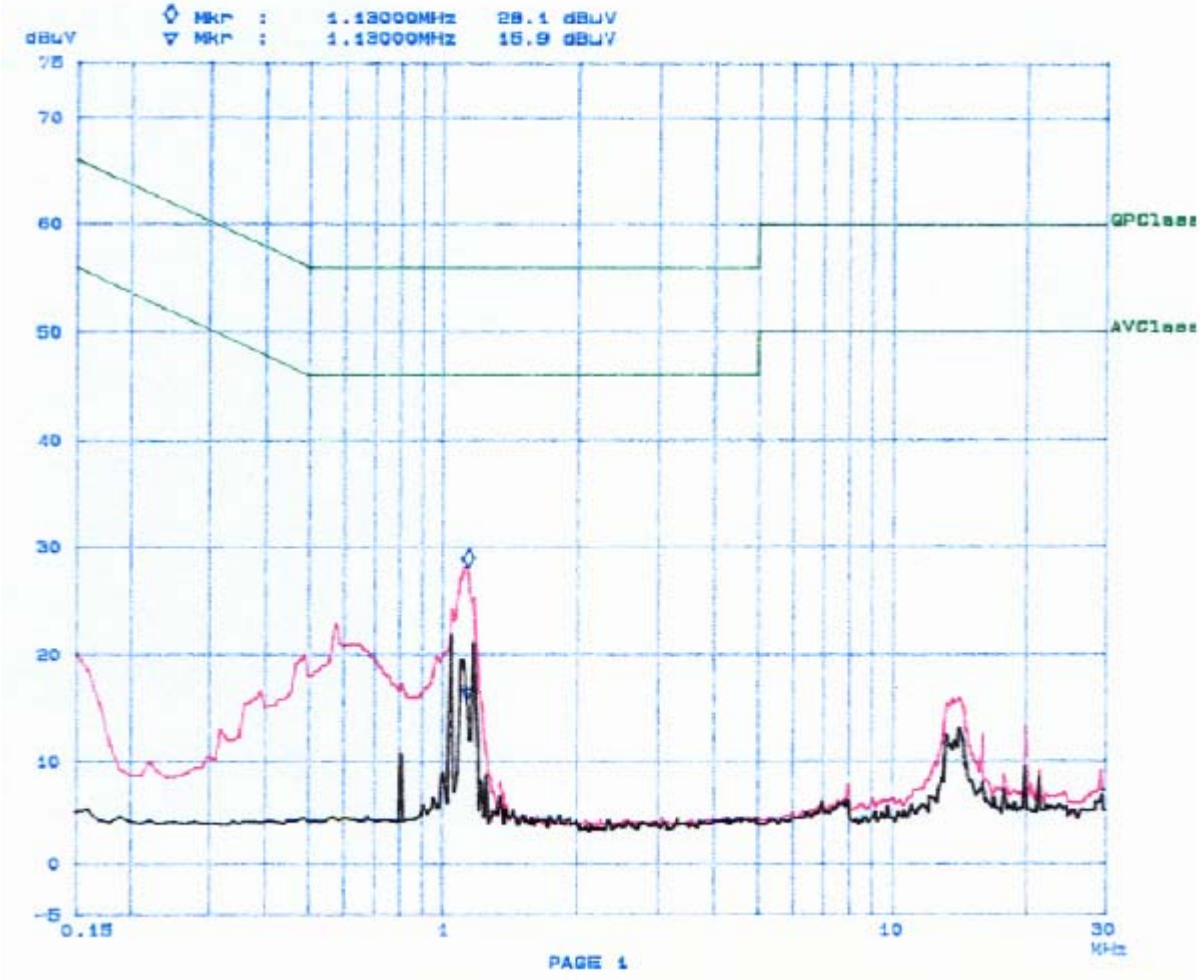
18. Apr 05 14:24

19/ April /05
Shell

EUT: 5.8GHz Cordless Phone Base
Manuf: CCT
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	10k	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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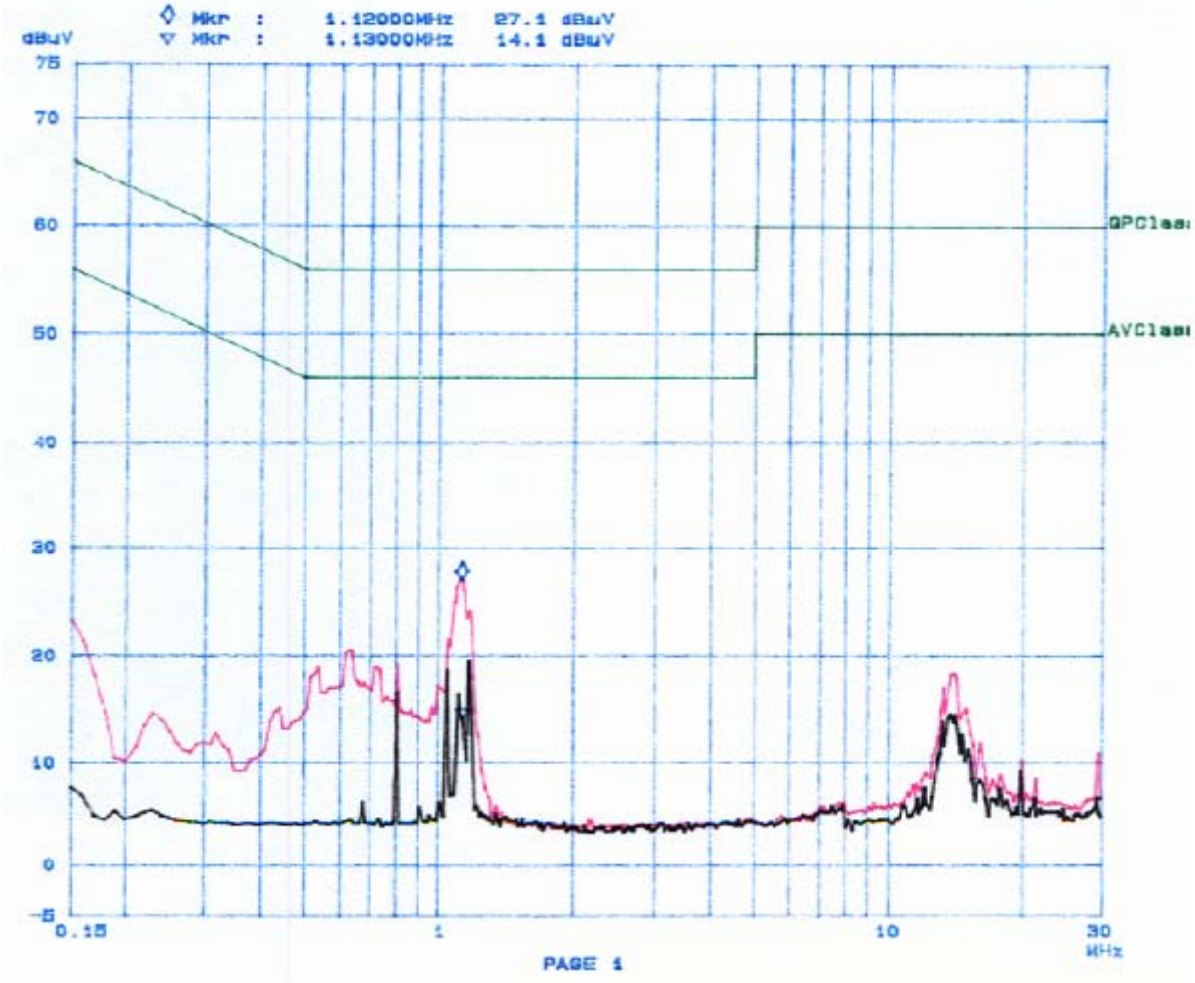
Bay Area Compliance Laboratory Corp 19. Apr 05 13:50
Class B

19/April/05
Shell

EUT: 5.8GHz Cordless Phone Base
Manuf: 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	10k	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 C63.4-2003. 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
EMCO	Antenna, Biconical	3110B	9603-2315	12/14/2004
HP	Amplifier, Pre	8447D	2944A10198	8/20/2004
Agilent	Analyzer, Spectrum	E4446A	US44300386	11/10/2004
EMCO	Antenna, Log-Periodic	3148	4-1155	12/14/2004
HP	Pre, Amplifier (1 ~ 26.5 GHz)	8449B	3147A00400	03/14/2004
Wisewave	Antenna, Horn, Std	ARH-2823-02	10555-02	12/13/2004

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

Environmental Conditions

Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

**The testing was performed by Snell Leong on 2005-04-20.*

Test Procedure

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 -0.8dB margin, within the measurement uncertainty of ±4.0dB, and had the worst margin of:

-0.9 dB at **11521.4400 MHz** in the **Vertical** polarization, Low Channel, 3 meters

-0.8 dB at **11598.14 MHz** in the **Vertical** polarization, Middle Channel, 3 meters

-1.4 dB at **11676.62 MHz** in the **Vertical** polarization, High Channel, 3 meters

-13.0 dB at **839.72 MHz** in the **Vertical** 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	dB	dB	dB	dBμV/m	dBμV/m	dB	
Low Channel											
11521.4400	60.8	180	2.0	v	39.1	5.4	32.2	73.1	74	-0.9	Peak
11521.4400	57.4	45	2.0	h	39.1	5.4	32.2	69.8	74	-4.2	Peak
11521.4400	35.1	120	2.0	v	39.1	5.4	32.2	47.4	54	-6.6	Ave
11521.4400	33.9	45	2.0	h	39.1	5.4	32.2	46.2	54	-7.8	Ave
1679.4500	53.0	180	2.0	v	25.3	1.9	36.3	43.9	54	-10.2	Ave
2073.5500	48.9	200	3.1	h	28.1	2.0	35.8	43.2	54	-10.8	Ave
1679.4500	51.5	200	3.1	h	25.3	1.9	36.3	42.4	54	-11.6	Ave
2073.5500	43.6	180	2.0	v	28.1	2.0	35.8	37.9	54	-16.1	Ave
1679.4500	56.1	180	2.0	v	25.3	1.9	36.3	47.0	74	-27.0	Peak
2073.5500	52.7	200	3.1	h	28.1	2.0	35.8	46.9	74	-27.1	Peak
1679.4500	54.2	200	3.1	h	25.3	1.9	36.3	45.1	74	-28.9	Peak
2073.5500	50.1	180	2.0	v	28.1	2.0	35.8	44.4	74	-29.6	Peak
Middle Channel											
11598.1400	60.9	180	2.0	v	39.1	5.4	32.2	73.2	74	-0.8	Peak
11598.1400	55.4	45	2.0	h	39.1	5.4	32.2	67.8	74	-6.2	Peak
11598.1400	35.1	120	2.0	v	39.1	5.4	32.2	47.4	54	-6.6	Ave
11598.1400	33.5	45	2.0	h	39.1	5.4	32.2	45.9	54	-8.1	Ave
1679.4500	53.0	120	1.5	v	25.3	1.9	36.3	43.9	54	-10.2	Ave
1679.4500	52.3	200	3.1	h	25.3	1.9	36.3	43.2	54	-10.8	Ave
2073.5500	48.5	200	3.1	h	28.1	2.0	35.8	42.8	54	-11.2	Ave
2073.5500	45.3	180	2.0	v	28.1	2.0	35.8	39.6	54	-14.4	Ave
1679.4500	56.0	120	1.5	v	25.3	1.9	36.3	46.8	74	-27.2	Peak
2073.5500	52.0	200	3.1	h	28.1	2.0	35.8	46.3	74	-27.7	Peak
1679.4500	54.7	200	3.1	h	25.3	1.9	36.3	45.6	74	-28.4	Peak
2073.5500	50.7	180	2.0	v	28.1	2.0	35.8	45.0	74	-29.0	Peak
High Channel											
11676.6200	60.3	180	2.0	v	39.1	5.4	32.2	72.6	74	-1.4	Peak
11676.6200	54.5	45	2.0	h	39.1	5.4	32.2	66.8	74	-7.2	Peak
11676.6200	34.5	120	2.0	v	39.1	5.4	32.2	46.8	54	-7.2	Ave
11676.6200	32.4	45	2.0	h	39.1	5.4	32.2	44.7	54	-9.3	Ave
1679.4500	52.8	120	1.5	v	25.3	1.9	36.3	43.7	54	-10.3	Ave
2073.5500	47.2	200	3.1	h	28.1	2.0	35.8	41.5	54	-12.5	Ave
2073.5500	46.6	180	2.0	v	28.1	2.0	35.8	40.9	54	-13.1	Ave
1679.4500	48.3	200	3.1	h	25.3	1.9	36.3	39.2	54	-14.8	Ave
1679.4500	56.0	120	1.5	v	25.3	1.9	36.3	46.9	74	-27.1	Peak
2073.5500	51.1	200	3.1	h	28.1	2.0	35.8	45.4	74	-28.6	Peak
2073.5500	50.7	180	2.0	v	28.1	2.0	35.8	45.0	74	-29.0	Peak
1679.4500	52.4	200	3.1	h	25.3	1.9	36.3	43.2	74	-30.8	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	dB	dB	dB	dBμV/m	dBμV/m	dB
839.72	35.19	90	2.0	V	22.6	3.8	28.6	33.0	46	-13.0
388.82	42.14	180	2.0	H	15.6	2.4	28.2	32.0	46	-14.0
839.72	33.10	300	1.8	H	22.6	3.8	28.6	30.9	46	-15.1
259.18	42.49	180	2.6	V	13.3	2.2	28.0	30.0	46	-16.0
259.18	41.51	0	2.0	H	13.3	2.2	28.0	29.0	46	-17.0
388.82	36.29	180	1.5	V	15.6	2.4	28.2	26.1	46	-19.9

§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	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

Environmental Conditions

Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

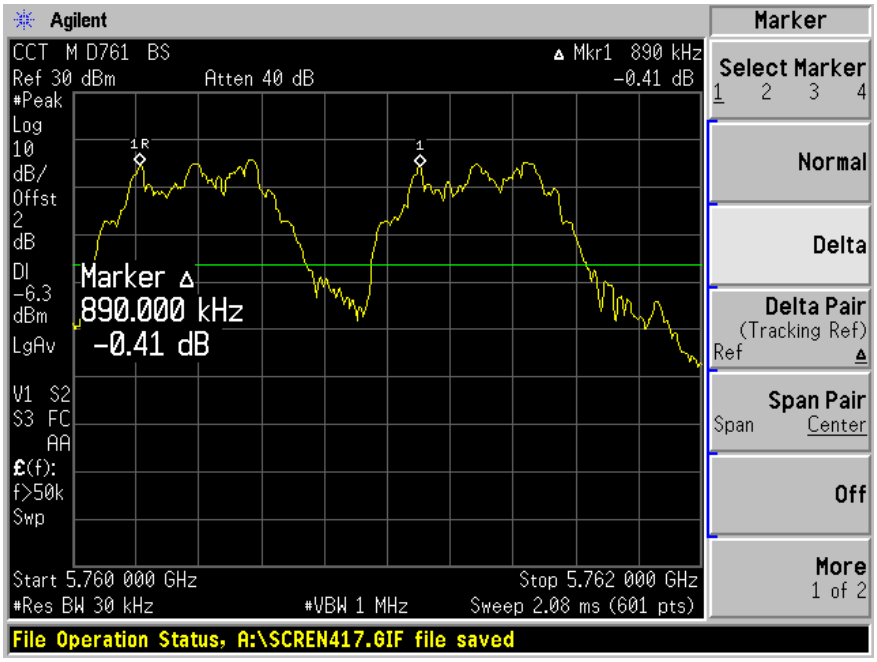
**The testing was performed by Snell Leong on 2005-04-20.*

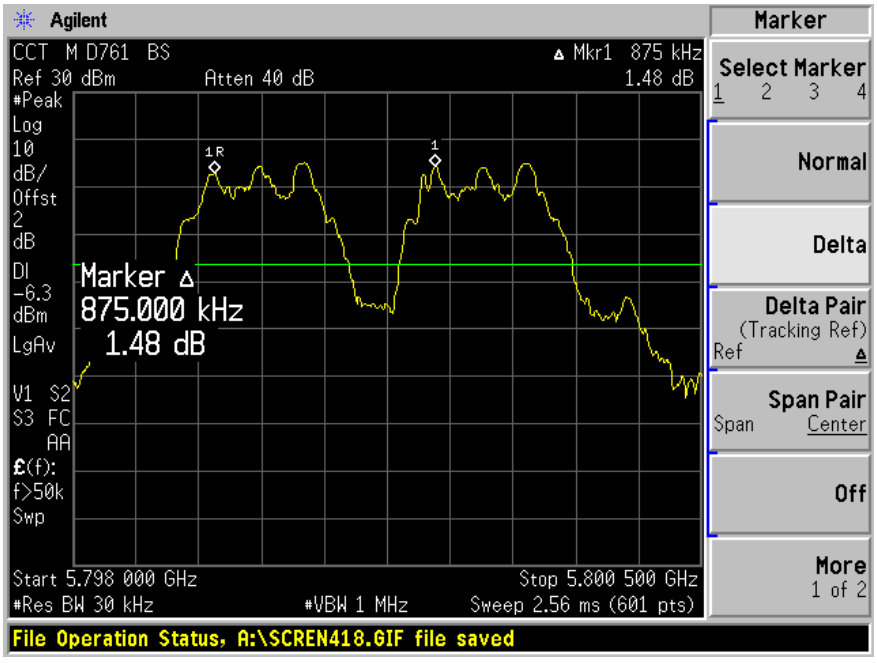
Measurement Results

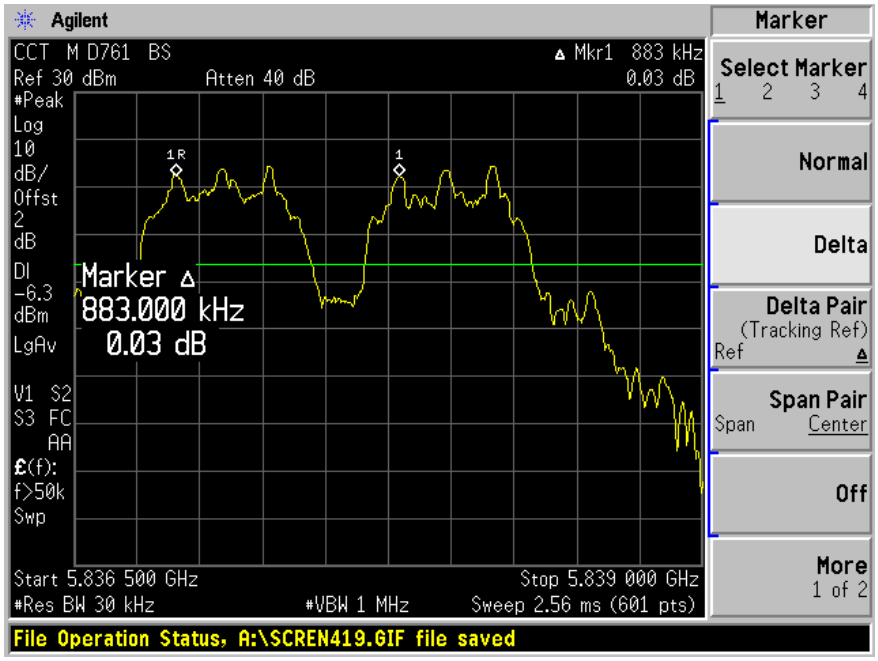
Channel	Frequency MHz	Channel Separation KHz
Low	5760.72	890
Mid	5799.07	875
High	5838.31	883

Plots of Hopping Channel Separation

Please see the following plots






Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 883 kHz
0.03 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-6.3
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
1R
1
Marker Δ
883.000 kHz
0.03 dB
Start 5.836 500 GHz
#Res BW 30 kHz
#VBW 1 MHz
Stop 5.839 000 GHz
Sweep 2.56 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN419.GIF file saved

§15.247 (a) (1) - CHANNEL BANDWIDTH

Standard Applicable

According to §15.247(a)(l)(ii), max 20dB bandwidth of hopping channel is 1MHz.

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	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

Environmental Conditions

Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

**The testing was performed by Snell Leong on 2005-04-20.*

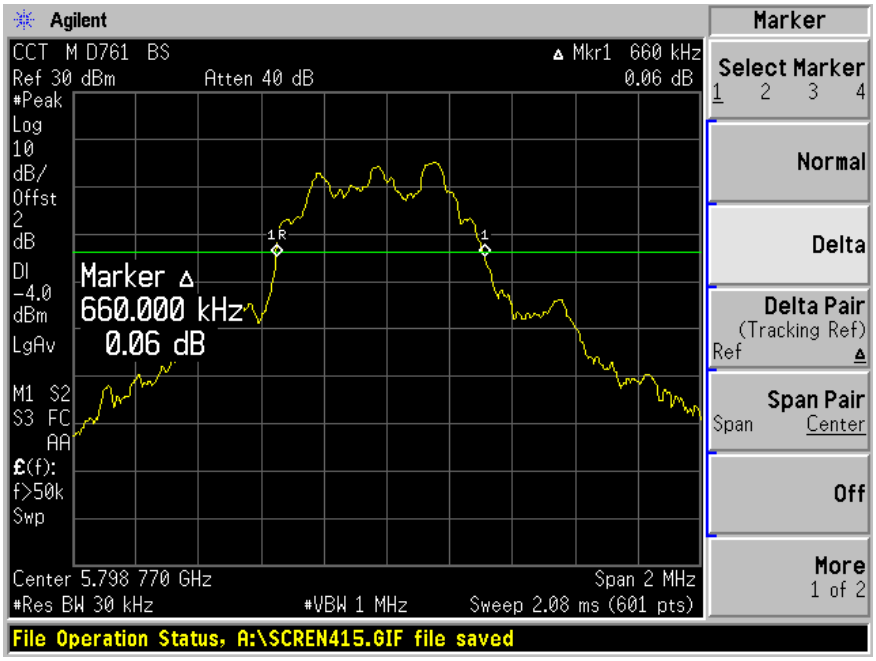
Measurement Result

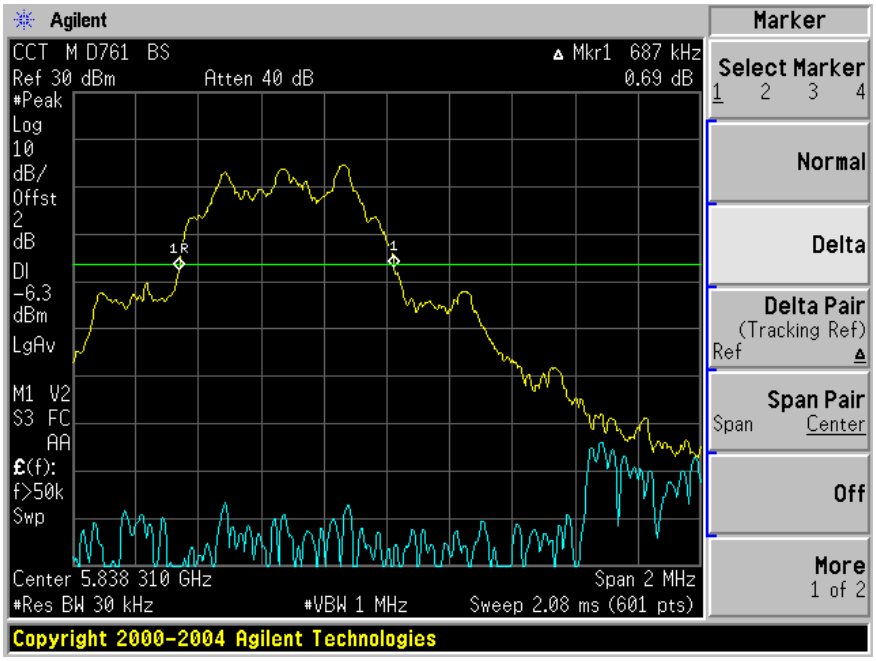
Channel	Frequency MHz	Channel Bandwidth KHz
Low	5760.72	667
Mid	5799.07	660
High	5838.31	687

Plot of Channel Bandwidth

Please see the following plots


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 667 kHz
0.48 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-4.0
dBm
LgAv
V1 S2
S3 FC
AA
£(f):
f>50k
Swp
Marker Δ
667.000 kHz
0.48 dB
Center 5.760 400 GHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 2.08 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN414.GIF file saved


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 660 kHz
0.06 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-4.0
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
f>50k
Swp
Marker Δ
660.000 kHz
0.06 dB
Center 5.798 770 GHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 2.08 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN415.GIF file saved


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 687 kHz
0.69 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-6.3
dBm
LgAv
M1 V2
S3 FC
AA
£(f):
f>50k
Swp
1R
1
Center 5.838 310 GHz
Span 2 MHz
#Res BW 30 kHz
#VBW 1 MHz
Sweep 2.08 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2004 Agilent Technologies

§15.247 (a) (1) (ii) - 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	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

Environmental Conditions

Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

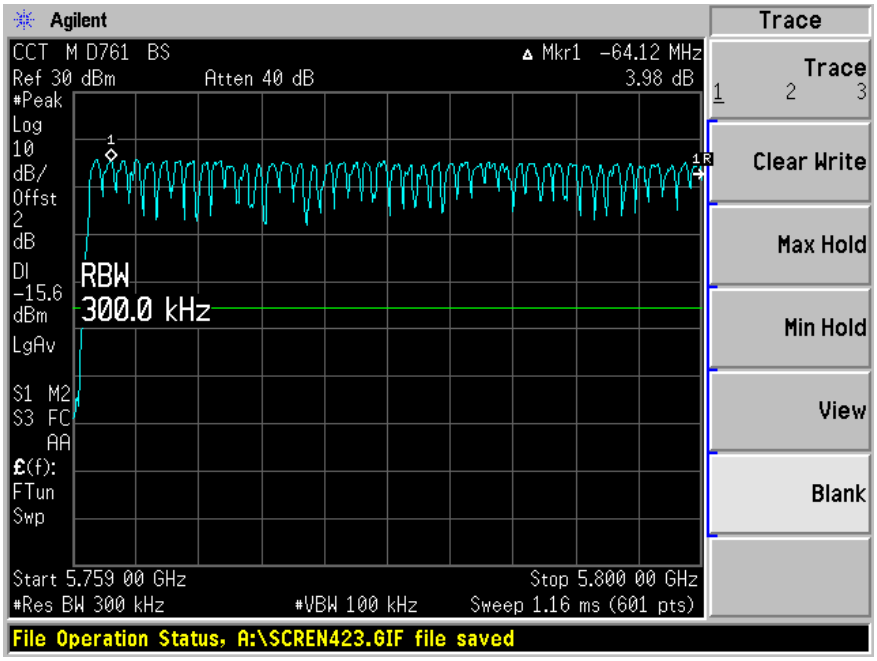
**The testing was performed by Snell Leong on 2005-04-20.*

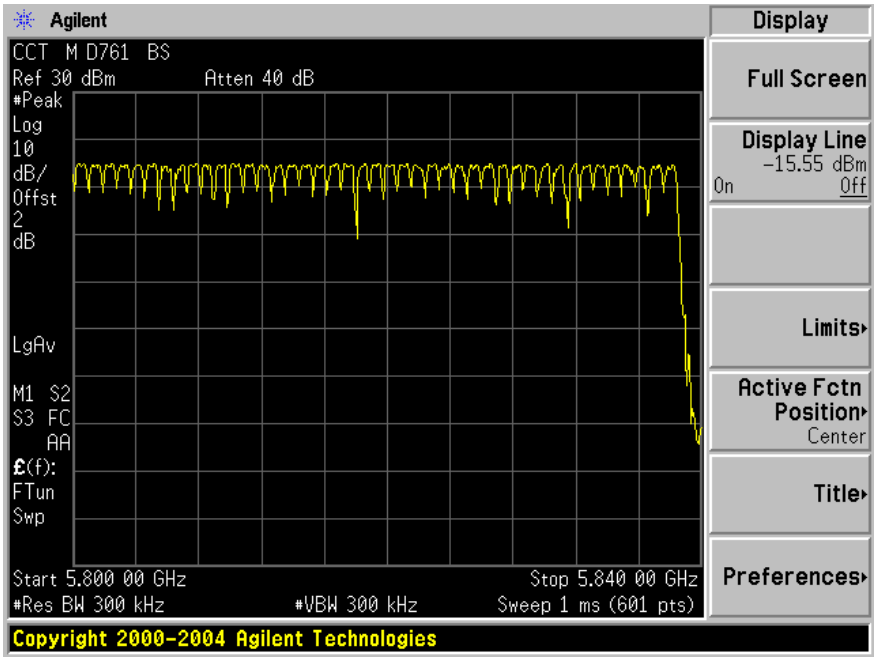
Measurement Results

Measurement	Standard	Result
88	75	Compliant

Plots of Number of Hopping Frequency

Please refer to the following plots.


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 -64.12 MHz
3.98 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-15.6
dBm
LgAv
S1 M2
S3 FC
AA
£(f):
FTun
Swp
RBW
300.0 kHz
Start 5.759 00 GHz
#Res BW 300 kHz
#VBW 100 kHz
Stop 5.800 00 GHz
Sweep 1.16 ms (601 pts)
File Operation Status, A:\SCREN423.GIF file saved
Trace
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
2
dB
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 5.800 00 GHz
#Res BW 300 kHz
#VBW 300 kHz
Stop 5.840 00 GHz
Sweep 1 ms (601 pts)
Copyright 2000-2004 Agilent Technologies
Display
Full Screen
Display Line
-15.55 dBm
On Off
Limits
Active Fctn
Position
Center
Title
Preferences

§15.247 9 (a) (1) (ii) - DWELL TIME

Standard Applicable

According to §15.247 (a)(1)(ii), the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a period of 30 seconds.

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	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

Environmental Conditions

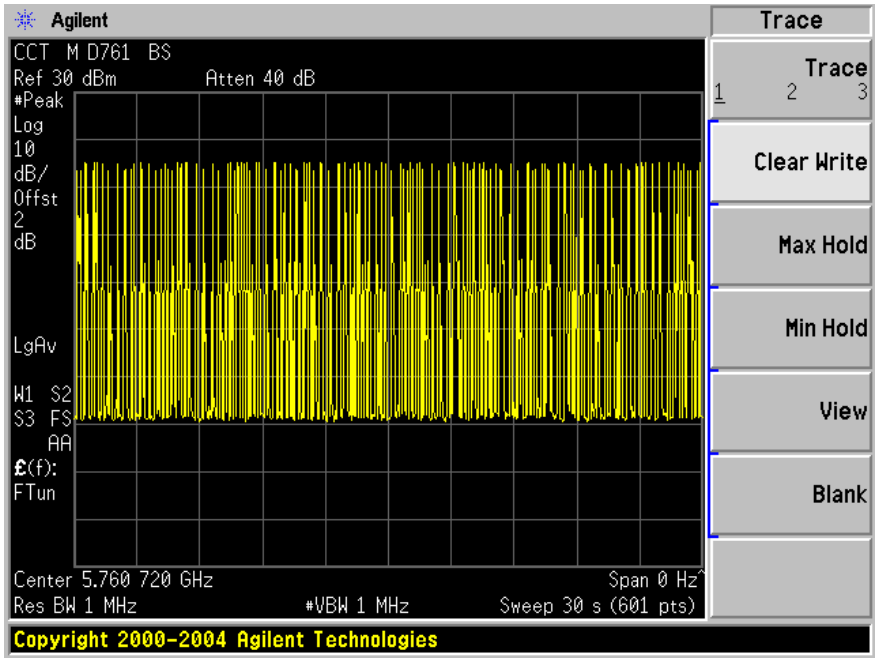
Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

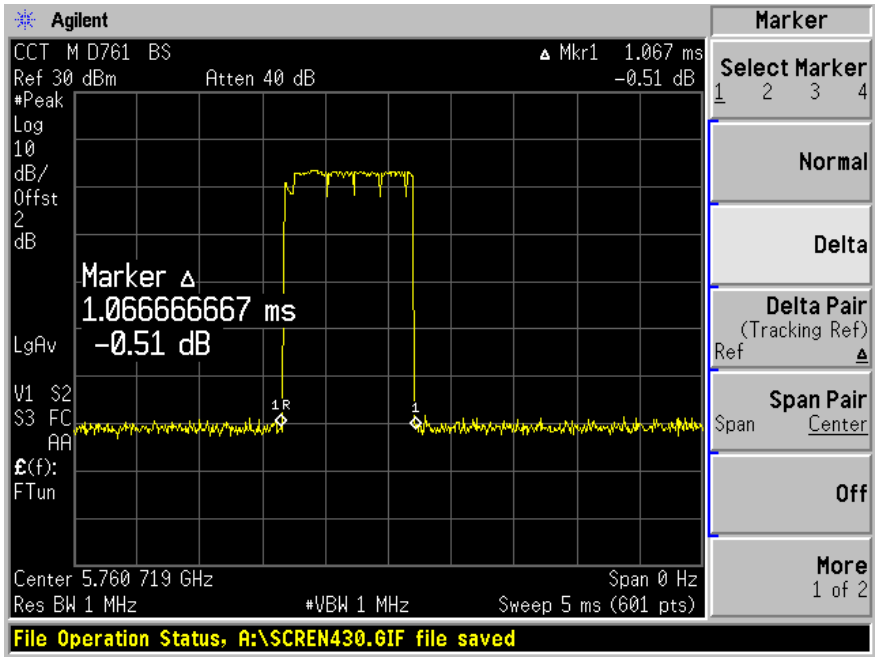
**The testing was performed by Snell Leong on 2005-04-20.*

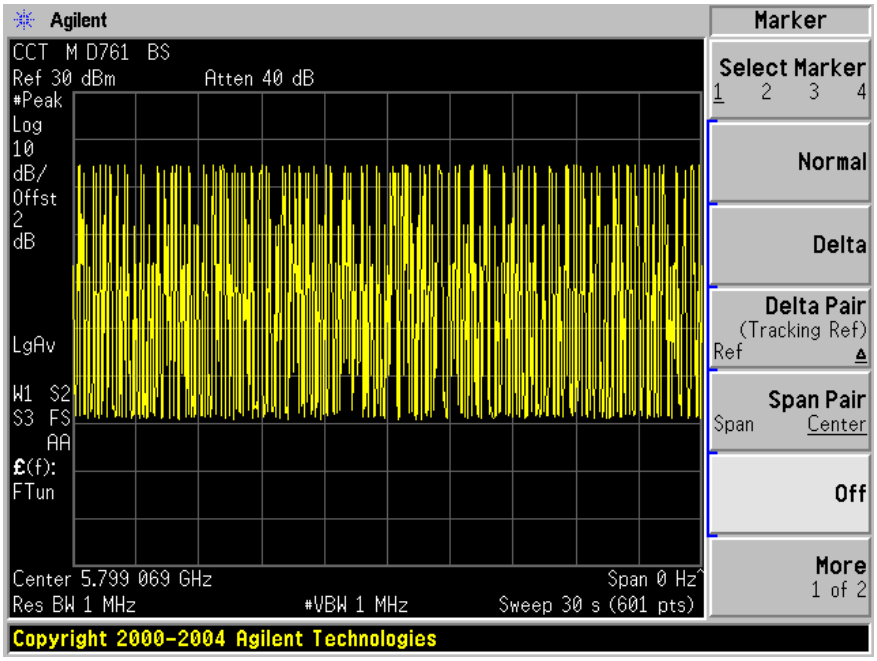
Measurement Results

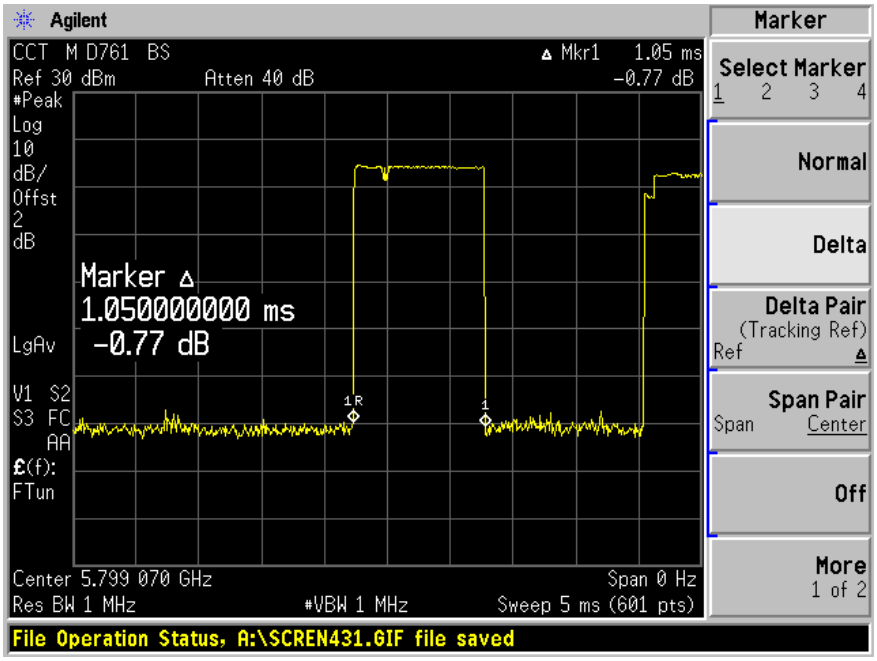
Channel	Frequency MHz	Pulse Wide uSec	Occupied time per Sec	Dwell Time Sec	Limit Sec
Low	5760.72	1067	104	0.111	0.4
Mid	5799.07	1050	138	0.1449	0.4
High	5838.31	1058.3	67	0.0709	0.4

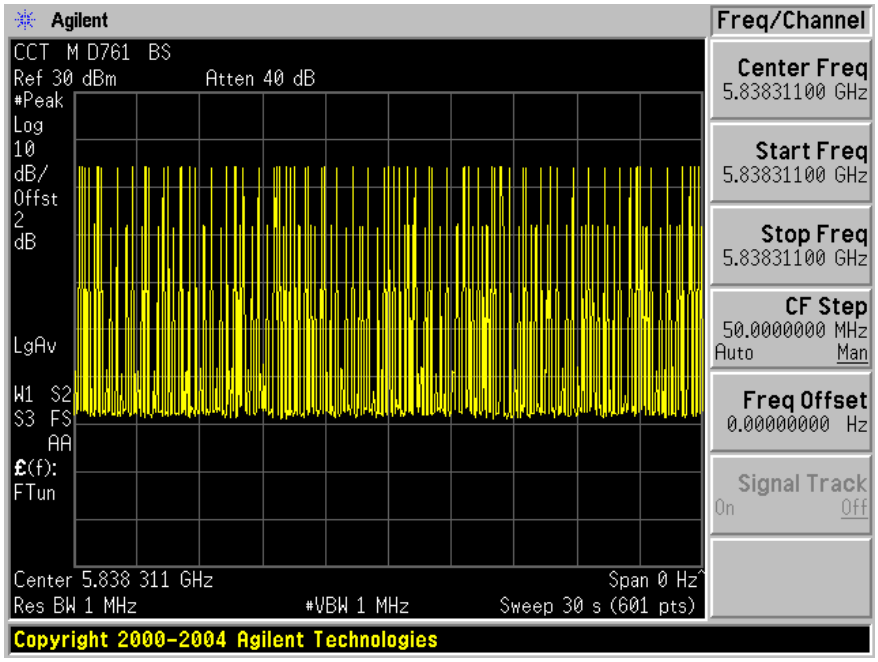
Plots of Dwell Time
Please refer the following plots.

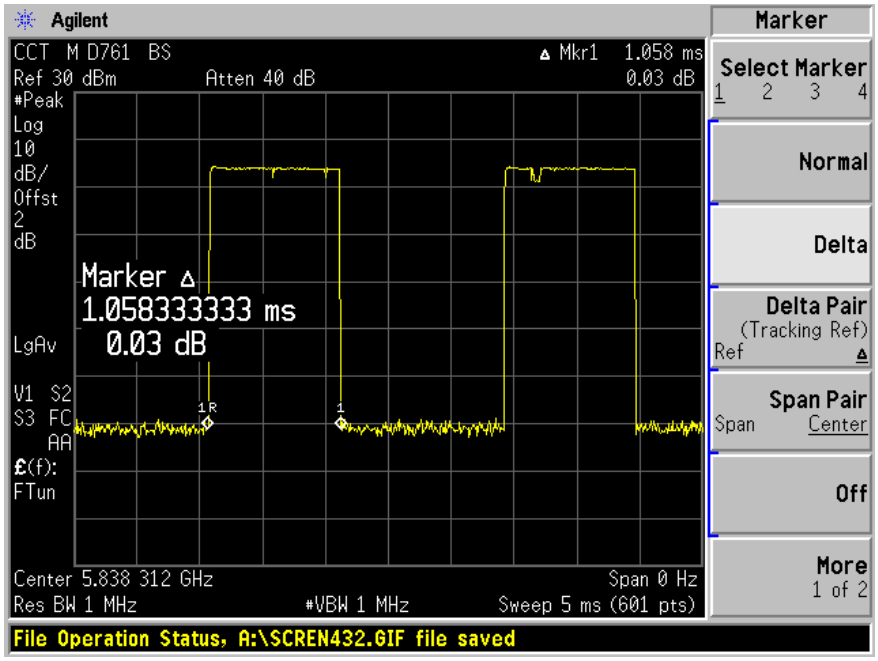

Agilent
Trace
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
2
dB
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank
Center 5.760 720 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 30 s (601 pts)
Copyright 2000-2004 Agilent Technologies


Agilent
Marker
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 1.067 ms
-0.51 dB
#Peak
Log
10
dB/
Offst
2
dB
Marker Δ
1.066666667 ms
-0.51 dB
LgAv
W1 S2
S3 FC
AA
£(f):
FTun
1R
1
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
Center 5.760 719 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 ms (601 pts)
File Operation Status, A:\SCREN430.GIF file saved


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
2
dB
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Center 5.799 069 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 30 s (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
Copyright 2000-2004 Agilent Technologies


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 1.05 ms
-0.77 dB
#Peak
Log
10
dB/
Offst
2
dB
Marker Δ
1.050000000 ms
-0.77 dB
LgAv
V1 S2
S3 FC
AA
£(f):
FTun
1R
1
Center 5.799 070 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN431.GIF file saved


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
#Peak
Log
10
dB/
Offst
2
dB
LgAv
W1 S2
S3 FS
AA
£(f):
FTun
Center 5.838 311 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 30 s (601 pts)
Freq/Channel
Center Freq
5.83831100 GHz
Start Freq
5.83831100 GHz
Stop Freq
5.83831100 GHz
CF Step
50.0000000 MHz
Auto Man
Freq Offset
0.00000000 Hz
Signal Track
On Off
Copyright 2000-2004 Agilent Technologies


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 1.058 ms
0.03 dB
#Peak
Log
10
dB/
Offst
2
dB
Marker Δ
1.058333333 ms
0.03 dB
LgAv
W1 S2
S3 FC
AA
£(f):
FTun
Center 5.838 312 GHz
Span 0 Hz
Res BW 1 MHz
#VBW 1 MHz
Sweep 5 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref Δ
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN432.GIF file saved

§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	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

Environmental Conditions

Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

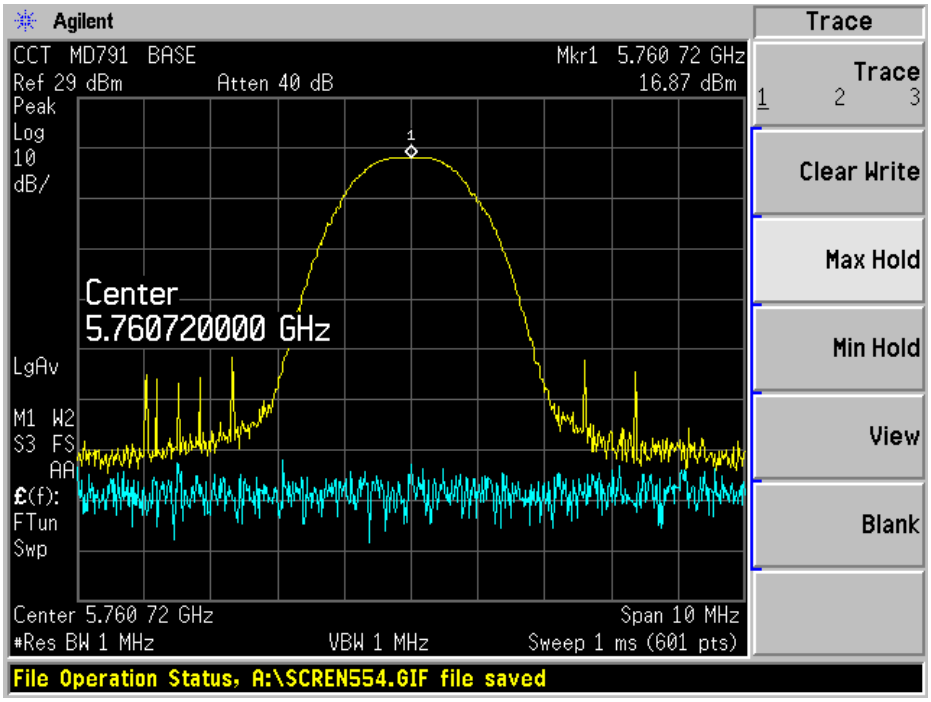
**The testing was performed by Snell Leong on 2005-04-20.*

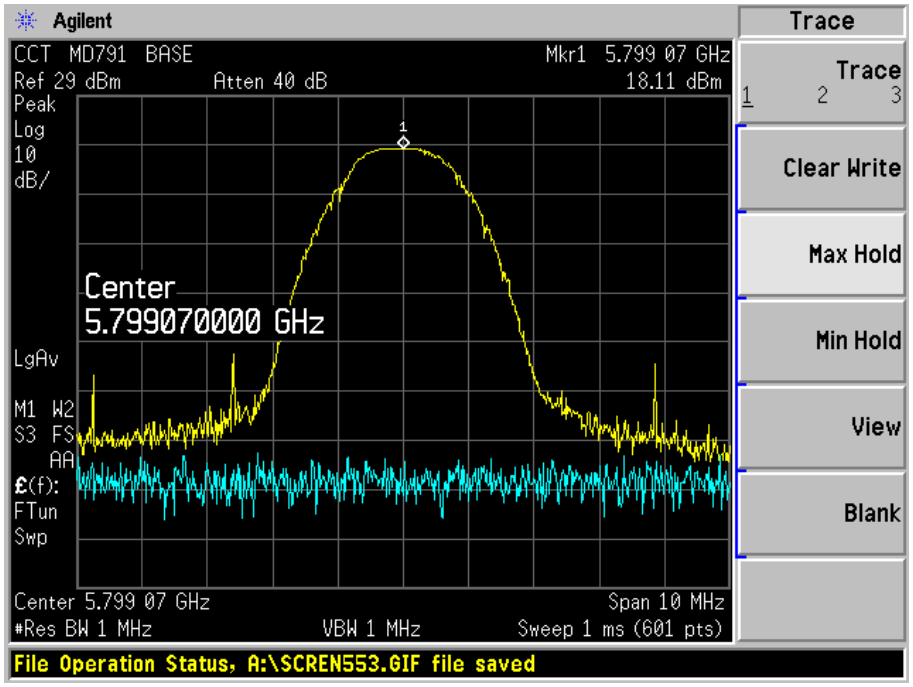
Measurement Result

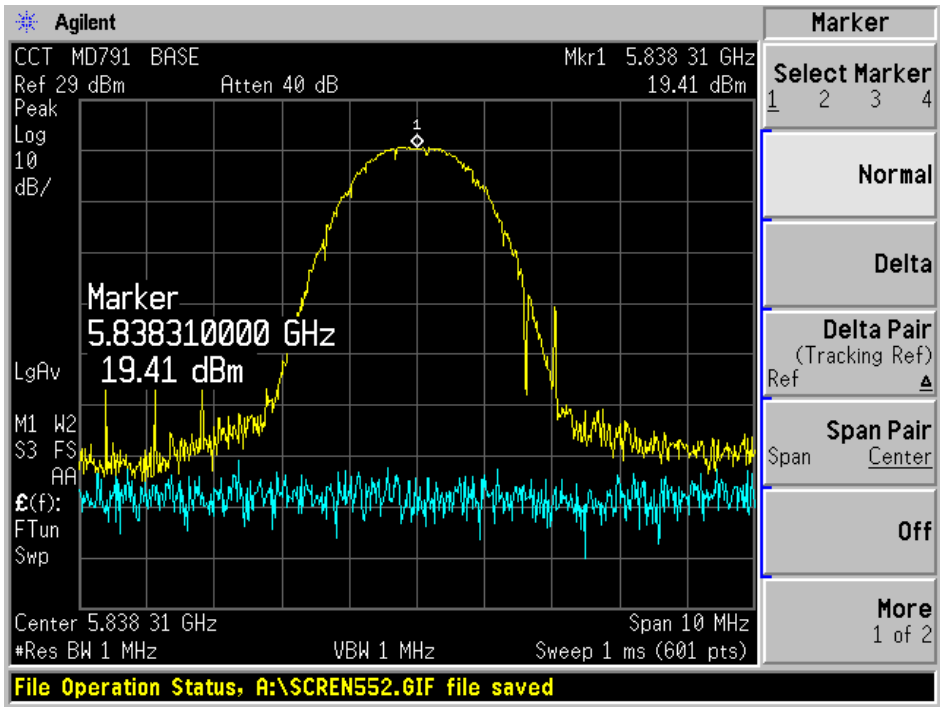
Channel	Frequency MHz	Max Peak Output Power (dBm)	Max Peak Output Power (m Watt)	Limit m watts	Result
Low	5760.72	16.87	48.64	1000	pass
Mid	5799.07	18.11	64.71	1000	pass
High	5838.31	19.41	87.30	1000	pass

Plots of Maximum Peak Output Power

Please refer to following plots.


Agilent
CCT MD791 BASE
Mkr1 5.760 72 GHz
Ref 29 dBm
Atten 40 dB
16.87 dBm
Peak
Log
10
dB/
Center
5.760720000 GHz
LgAv
M1 W2
S3 FS
AA
£(f):
FTun
Swp
Center 5.760 72 GHz
Span 10 MHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 1 ms (601 pts)
File Operation Status, A:\SCREN554.GIF file saved
Trace
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank


Agilent
CCT MD791 BASE
Mkr1 5.799 07 GHz
Ref 29 dBm
Atten 40 dB
18.11 dBm
Peak
Log
10
dB/
Center
5.799070000 GHz
LgAv
M1 W2
S3 FS
AA
£(f):
FTun
Swp
Center 5.799 07 GHz
Span 10 MHz
#Res BW 1 MHz
VBW 1 MHz
Sweep 1 ms (601 pts)
File Operation Status, A:\SCREN553.GIF file saved
Trace
Trace
1 2 3
Clear Write
Max Hold
Min Hold
View
Blank


Agilent
CCT MD791 BASE
Ref 29 dBm
Atten 40 dB
Mkr1 5.838 31 GHz
19.41 dBm
Peak
Log
10
dB/
Marker
5.838310000 GHz
19.41 dBm
LgAv
M1 W2
S3 FS
AA
£(f):
FTun
Swp
Center 5.838 31 GHz
#Res BW 1 MHz
VBW 1 MHz
Span 10 MHz
Sweep 1 ms (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN552.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 §2.1091 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: 15.67 (dBm)
Maximum peak output power at antenna input terminal: 36.90 (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: 0.007(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 0.007 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 (d) - 100 KHZ BANDWIDTH OF BAND EDGES

Standard Applicable

According to §15.247(d), in any 100 kHz bandwidth outside the frequency band in which the spread spectrum intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB below that in the 100 kHz bandwidth within the 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	Description	Model No.	Serial No.	Calibration Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

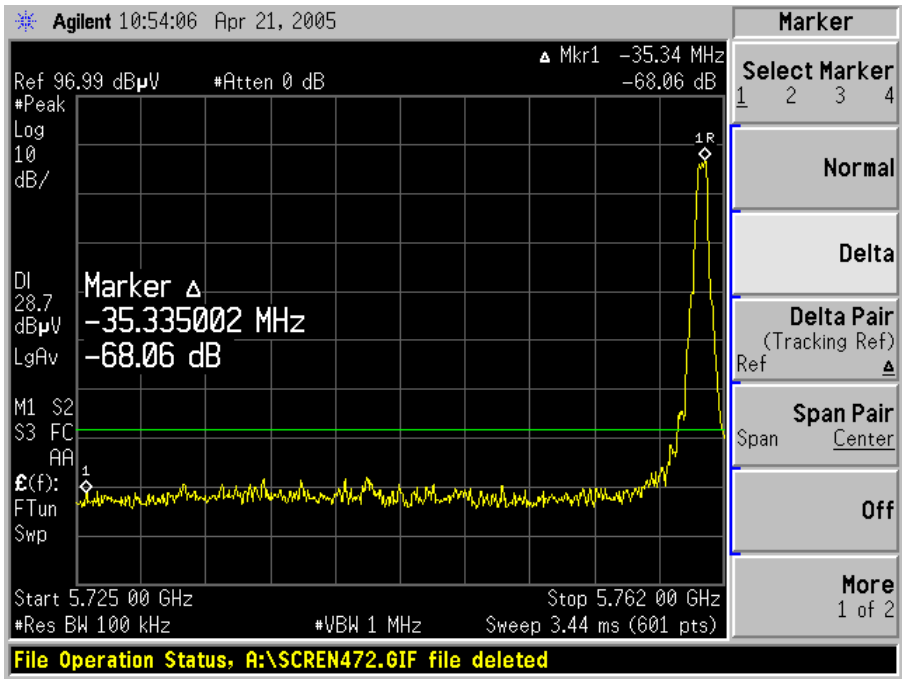
Environmental Conditions

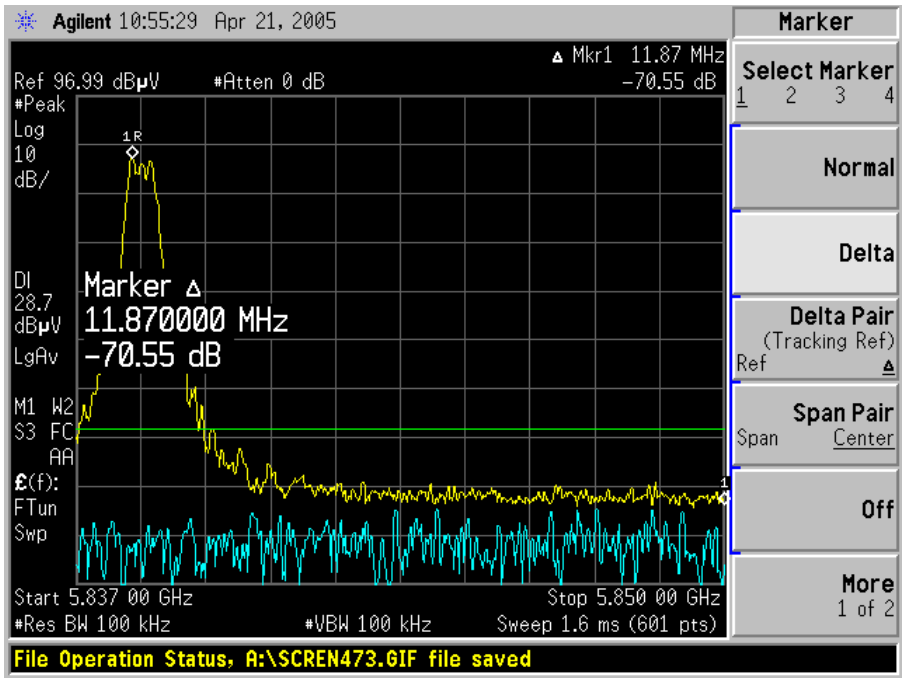
Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

**The testing was performed by Snell Leong on 2005-04-20.*

Plots of 100kHz Bandwidth of Band Edge

Please refer the following plots.


Agilent 10:54:06 Apr 21, 2005
Marker
Mkr1 -35.34 MHz
-68.06 dB
Ref 96.99 dBµV
#Atten 0 dB
#Peak
Log
10
dB/
1R
DI
28.7
dBµV
LgAv
Marker Δ
-35.335002 MHz
-68.06 dB
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 5.725 00 GHz
Stop 5.762 00 GHz
#Res BW 100 kHz
#VBW 1 MHz
Sweep 3.44 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN472.GIF file deleted


Agilent 10:55:29 Apr 21, 2005
Marker
Mkr1 11.87 MHz
-70.55 dB
Ref 96.99 dBµV
#Atten 0 dB
#Peak
Log
10
dB/
1R
DI
28.7
dBµV
LgAv
Marker Δ
11.870000 MHz
-70.55 dB
M1 W2
S3 FC
AA
£(f):
FTun
Swp
Start 5.837 00 GHz
Stop 5.850 00 GHz
#Res BW 100 kHz
#VBW 100 kHz
Sweep 1.6 ms (601 pts)
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, A:\SCREN473.GIF file saved

§2.1051 - 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	Description	Model	Serial Number	Cal. Date
Agilent	Spectrum Analyzer	E4446A	US44300386	2004-11-10

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

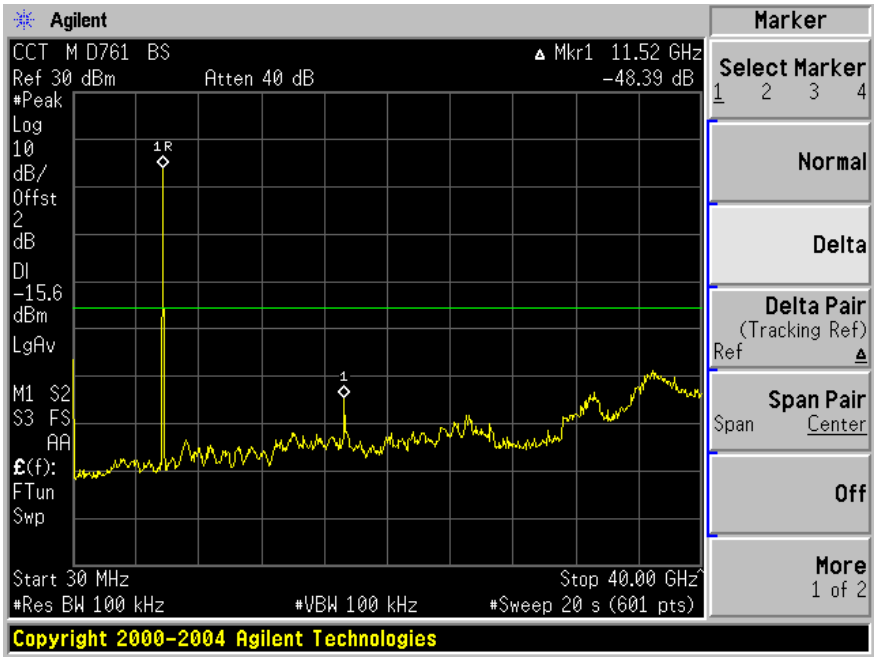
Environmental Conditions

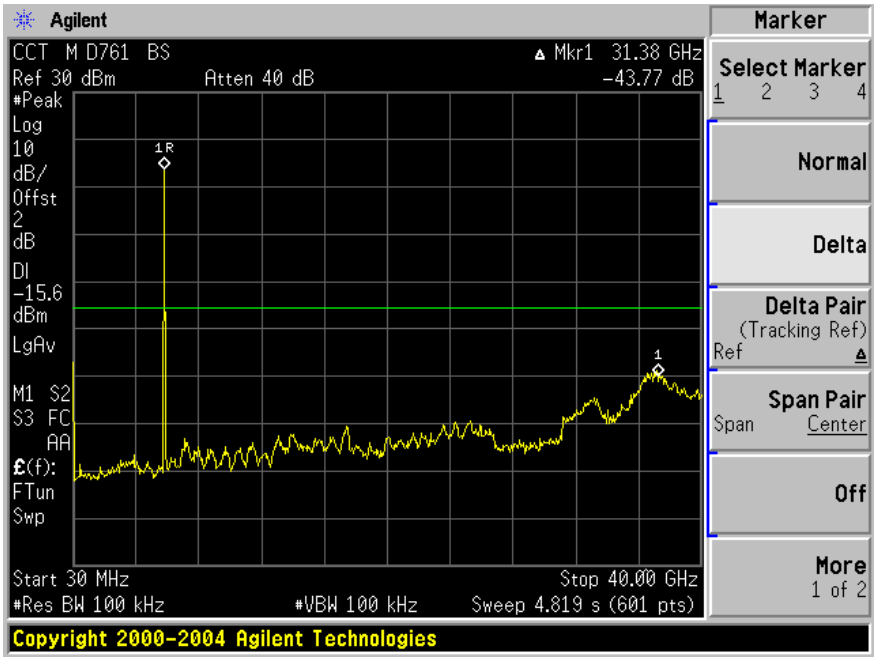
Temperature:	22° C
Relative Humidity:	54%
ATM Pressure:	1016 mbar

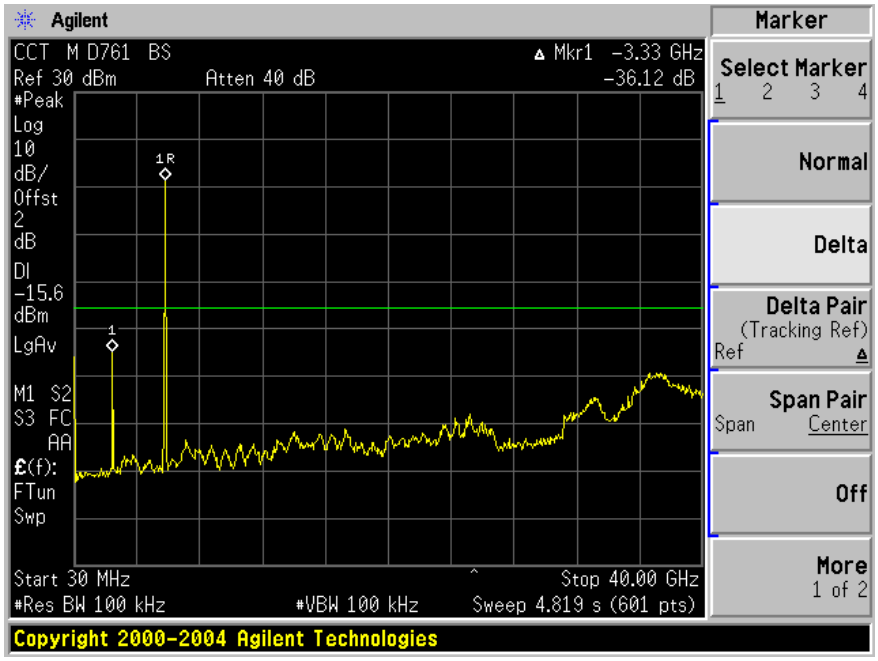
**The testing was performed by Snell Leong on 2005-04-20.*

Measurement Results

Please refer to the following plots.


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 11.52 GHz
-48.39 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-15.6
dBm
LgAv
M1 S2
S3 FS
AA
£(f):
FTun
Swp
Start 30 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 40.00 GHz
#Sweep 20 s (601 pts)
Copyright 2000-2004 Agilent Technologies
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 31.38 GHz
-43.77 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-15.6
dBm
LgAv
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 30 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 40.00 GHz
Sweep 4.819 s (601 pts)
Copyright 2000-2004 Agilent Technologies
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2


Agilent
CCT M D761 BS
Ref 30 dBm
Atten 40 dB
Mkr1 -3.33 GHz
-36.12 dB
#Peak
Log
10
dB/
Offst
2
dB
Dl
-15.6
dBm
LgAv
1R
1
M1 S2
S3 FC
AA
£(f):
FTun
Swp
Start 30 MHz
#Res BW 100 kHz
#VBW 100 kHz
Stop 40.00 GHz
Sweep 4.819 s (601 pts)
Marker
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
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