NVLAP LAB CODE 200707-0

FCC PART 15.247

MEASUREMENT AND TEST REPORT

For

Infinia Electronics Co., Ltd.DG

Bldg. 2 Chenwu Industrial Dist. Houjie.
Dongguan Guangdong. P.R. of China

FCC ID: UF5NOMAD-HKT450

This Report Concerns:	Equipment Type:
☒ Original Report	Bluetooth Speakerphone

Test Engineer:	Jim Li
Report No.:	RSZ08070806
Test Date:	2008-07-14 to 2008-07-25
Report Date:	2008-07-25
Reviewed By:	EMC Manager: Green Xu
Prepared By:	Bay Area Compliance Laboratories Corp. (Shenzhen) 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China Tel: +86-755-33320018 Fax: +86-755-33320008

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GENERAL INFORMATION

Product Description for Equipment under Test (EUT)

The *Infinia Electronics Co., Ltd.DG's* product, model number: *HKT450; Nomad750; Nomad760 o*r the "EUT" as referred to in this report is a *Bluetooth Speakerphone*, which measures approximately: 13.3 cm L x 5.0 cm W x 1.1 cm H, input voltage: DC 5.0V from adapter and 3.7V from battery.

Adapter Information:
Model: 562;
Input: 100-240V~ 50Hz 0.15A;
Output: 5.0V ⎓ 500mA

*Note: The series products, model *HKT450; Nomad750; Nomad760*, we select *HKT450* to test, the all model have same circuit diagram, PCB, only appearance have difference, which was explained in the attached Declaration Letter.

** All measurement and test data in this report was gathered from production sample serial number: 0807025 (Assigned by BACL, Shenzhen). The EUT was received on 2008-07-08.*

Objective

This Type approval report is prepared on behalf of *Infinia Electronics Co., Ltd.DG in* accordance with Part 2, Subpart J, Part 15, Subparts A, B and C of the Federal Communication Commissions rules.

The tests were performed in order to determine compliance with FCC Part 15, Subpart C, and section 15.203, 15.205, 15.207, 15.209 and 15.247 rules.

Related Submittal(s)/Grant(s)

No related submittal(s).

Test Methodology

All measurements contained in this report were conducted with ANSI C63.4-2003, American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the range of 9 kHz to 40 GHz.

All emissions measurement was performed and Bay Area Compliance Laboratories Corp. (Shenzhen). The radiated testing was performed at an antenna-to-EUT distance of 3 meters.

Test Facility

The Test site used by Bay Area Compliance Laboratories Corp. (Shenzhen) to collect test data is located in the 6/F, the 3rd Phase of WanLi Industrial Building, ShiHua Road, FuTian Free Trade Zone Shenzhen, Guangdong, China.

Test site at Bay Area Compliance Laboratories Corp. (Shenzhen) has been fully described in reports submitted to the Federal Communication Commission (FCC). The details of these reports have been found to be in compliance with the requirements of Section 2.948 of the FCC Rules on November 04, 2004. 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 has the reports on file and is listed under FCC Registration No.: 382179. The test site has been approved by the FCC for public use and is listed in the FCC Public Access Link (PAL) database.

Additionally, Bay Area Compliance Laboratories Corp. (Shenzhen) is a National Institute of Standards and Technology (NIST) accredited laboratory, under the National Voluntary Laboratory Accredited Program (Lab Code 200707-0).

NVLAP LAB CODE 200707-0

The current scope of accreditations can be found at
http://ts.nist.gov/Standards/scopes/2007070.htm

SYSTEM TEST CONFIGURATION

Description of Test Configuration

The system was configured for testing in a typical fashion (as normally used by a typical user).

Equipment Modifications

No modification was made to the unit tested.

Local Support Equipment List and Details

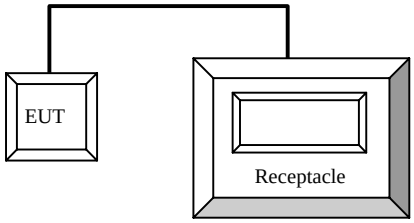
Manufacturer	Description	Model	Serial Number	FCC ID
COMPAQ	Notebook	PP2040	N610Cp180X430VC250	DoC

External I/O Cable

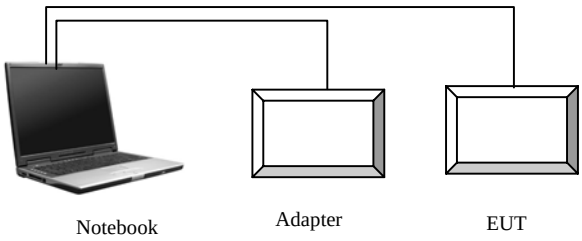
Cable Description	Length (m)	From Port	To
Unshielded Detachable DC Cable	12.7	EUT	Adapter

Configuration of Test Setup

Conducted Emissions:

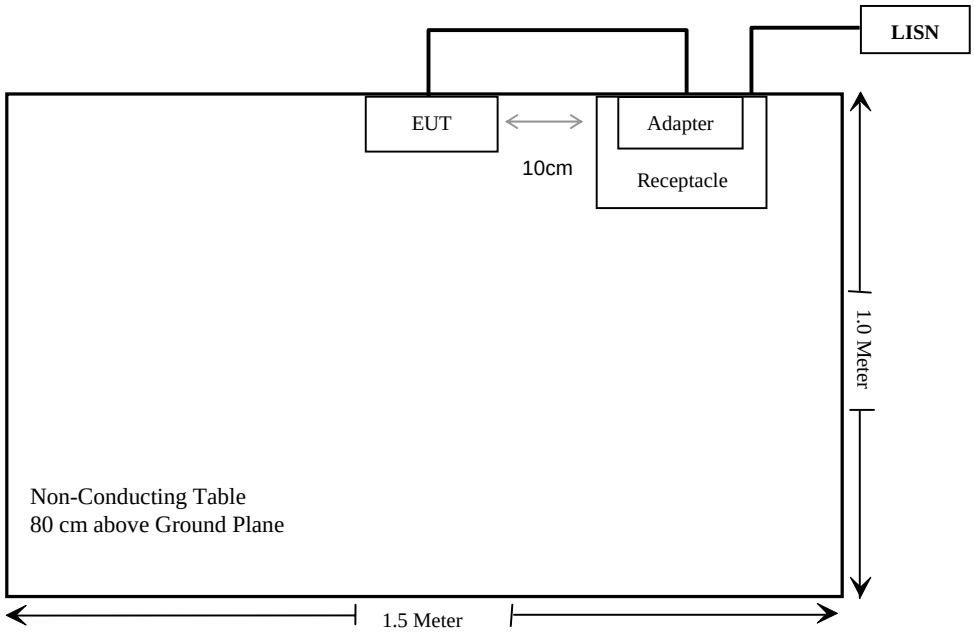


Radiated Emissoins:

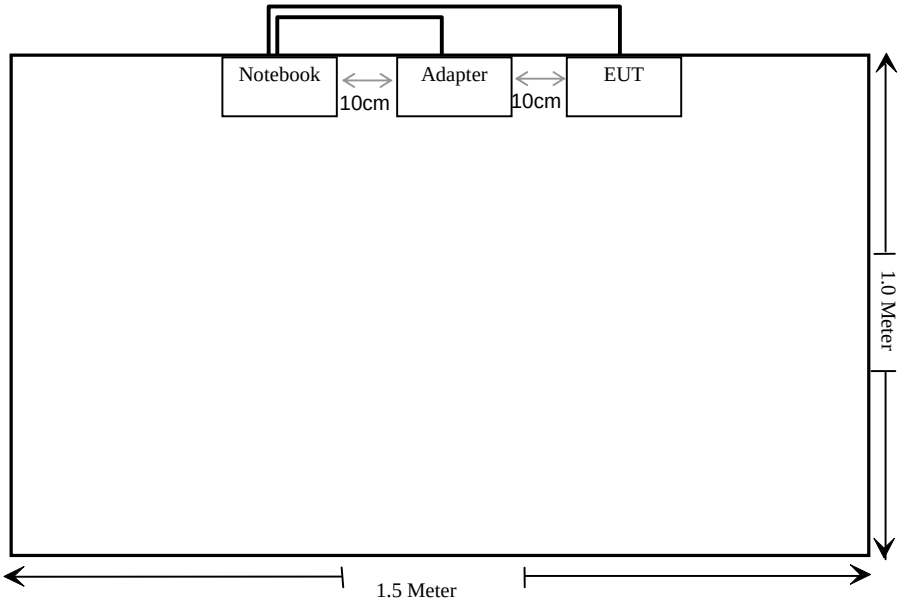


Block Diagram of Test Setup

Conducted Emissions:



Radiated Emissoins:



SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.247 (i), §1.1307 (b)(1)	Maximun Permissible exposure	Compliant
§15.203	Antenna Requirement	Compliant
§15.207 (a)	Conducted Emissions	Compliant
§15.205, §15.209, §15.247(d)	Radiated Emission	Compliant
§15.247 (a)(1)	20 dB Bandwidth	Compliant
§15.247(a)(1)	Channel Separation Test	Compliant
§15.247(a)(1)(iii)	Time of occupancy (Dwell Time)	Compliant
§15.247(a)(1)(iii)	Quantity of hopping channel Test	Compliant
§15.247(b)(1)	Peak Output Power Measurement	Compliant
§15.247(d)	Band edges	Compliant

§15.247 (i) and §1.1307(b) (1) - MAXIMUN PERMISSIBLE EXPOSURE

Standard Applicable

According to §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 General Population/Uncontrolled Exposure

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm2)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f2)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

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

Test Data

Predication of MPE limit at a given distance
$S = PG/4\pi R^2$
S = power density (in appropriate units, e.g. mW/cm^2)
P = power input to the antenna (in appropriate units, e.g., mW).
G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.
R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

For Low Channel:

Maximum peak output power at antenna input terminal: 3.43 (dBm)
Maximum peak output power at antenna input terminal: 2.203 (mW)
Prediction distance: >20 (cm)
Predication frequency: 2402 (MHz)
Antenna Gain (typical): 2.0(dBi)
Antenna Gain (typical): 1.584 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.000695(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm^2)

0.000695 (mW/cm2) < 1 (mW/cm^2)

Result: Compliant

For Middle Channel:

Maximum peak output power at antenna input terminal: 2.74 (dBm)
Maximum peak output power at antenna input terminal: 1.879 (mW)
Prediction distance: >20 (cm)

Predication frequency: 2441 (MHz)
Antenna Gain (typical): 2.0(dBi)

Antenna Gain (typical): 1.584 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.000592(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1 (mW/cm^2)

0.000592 (mW/cm2) < 1.0 (mW/cm^2)

For High Channel:

Maximum peak output power at antenna input terminal: 3.21 (dBm)
Maximum peak output power at antenna input terminal: 2.094 (mW)
Prediction distance: >20 (cm)
Predication frequency: 2480 (MHz)
Antenna Gain (typical): 2.0(dBi)
Antenna Gain (typical): 1.584 (numeric)
The worst case is power density at predication frequency at 20 cm: 0.000660(mW/cm^2)
MPE limit for general population exposure at prediction frequency: 1.0 (mW/cm^2)

0.000660 (mW/cm2) < 1.0 (mW/cm^2)

Result: Compliant

CFR47 §15.203 - ANTENNA REQUIREMENT

Standard Applicable

According to CFr47 § 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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

Antenna Connector Construction

The EUT has a printed antenna on PCB. The maximum gain is 2 dBi, please refer to the internal photos.

Result: Compliant.

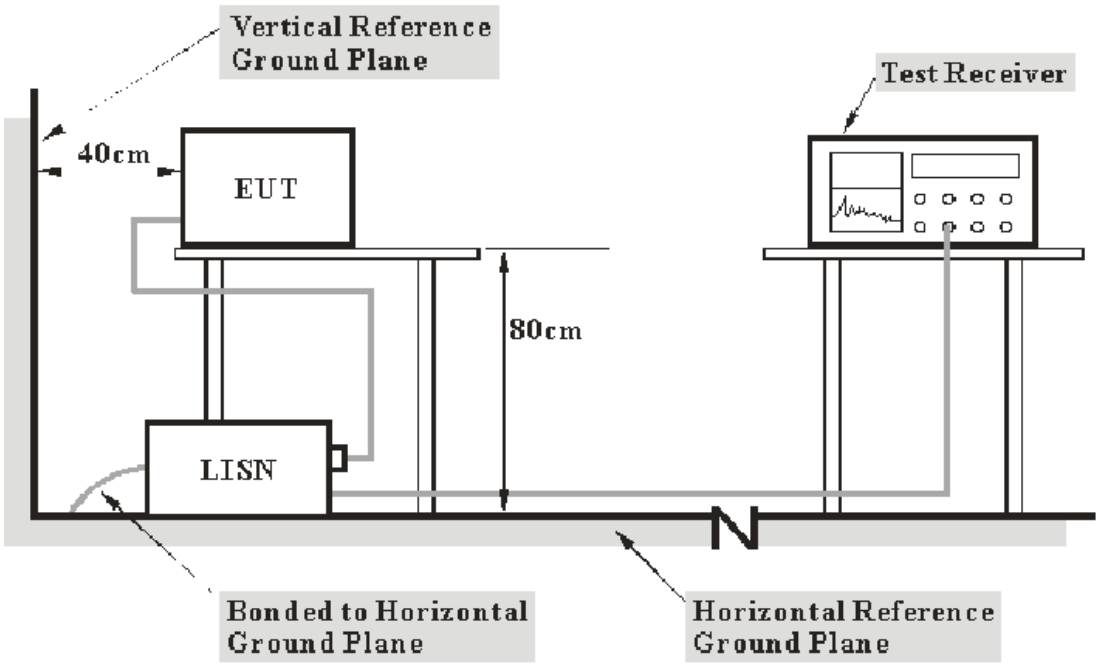
§15.207 (a) - CONDUCTED EMISSIONS

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 Bay Area Compliance Laboratory Corp. (Shenzhen) is ±2.4 dB.

EUT Setup



Note: 1. Support units were connected to second LISN.
2. Both of LISNs (AMN) 80 cm from EUT and at the least 80 cm from other units and other metal planes support units.

The setup of EUT is according with per ANSI C63.4-2003 measurement procedure. The specification used was with the FCC Part 15 Class B limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver Setup

The EMI test receiver was set to investigate the spectrum from 150 kHz to 30 MHz.

During the conducted emission test, the EMI test receiver was set with the following configurations:

Frequency Range	***IF B/W***
150 kHz – 30 MHz	9 kHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Com-Power	L.I.S.N.	LI-200	12005	N/A	N/A
Com-Power	L.I.S.N.	LI-200	12208	N/A	N/A
Rohde & Schwarz	EMI Test Receiver	ESCS30	DE25330	2008-03-25	2009-03-25
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2008-03-25	2009-03-25

***** Com-Power's LISN were used as the supporting equipment.
*** Statement of Traceability:** Bay Area Compliance Laboratory Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

During the conducted emission test, the adapter was connected to the outlet of the LISN.

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

All data was recorded in the Quasi-peak and average detection mode.

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Part 15.207, with the worst margin reading of:

6.55 dB at **0.425 MHz** in the **Neutral** conductor mode

Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.0 kPa

The testing was performed by Jim Li on 2008-07-14.

Test Mode: Charging

Line Conducted Emissions				FCC Part 15.207	
Frequency (MHz)	**Amplitude (dBμV)**	**Detector (QP/AV)**	**Conductor (Hot/Neutral)**	**Limit (dBμV)**	**Margin (dB)**
0.425	50.80	QP	Neutral	57.35	6.55
0.425	38.80	AV	Neutral	47.35	8.55
0.380	49.10	QP	Neutral	58.28	9.18
0.185	53.40	QP	Neutral	64.26	10.86
0.355	47.70	QP	Hot	58.84	11.14
0.380	36.90	AV	Neutral	48.28	11.38
24.735	48.50	QP	Hot	60.00	11.50
0.355	37.10	AV	Hot	48.84	11.74
0.330	46.90	QP	Neutral	59.45	12.55
0.330	35.90	AV	Neutral	49.45	13.55
0.235	48.50	QP	Neutral	62.27	13.77
1.510	41.80	QP	Hot	56.00	14.20
0.280	45.30	QP	Neutral	60.82	15.52
0.185	38.50	AV	Neutral	54.26	15.76
0.455	40.60	QP	Hot	56.78	16.18
0.665	39.70	QP	Hot	56.00	16.30
0.235	35.70	AV	Neutral	52.27	16.57
0.455	29.20	AV	Hot	46.78	17.58
0.665	26.90	AV	Hot	46.00	19.10
0.175	43.50	QP	Hot	64.72	21.22
1.510	24.60	AV	Hot	46.00	21.40
0.280	29.00	AV	Neutral	50.82	21.82
0.175	31.90	AV	Hot	54.72	22.82
24.735	14.00	AV	Hot	50.00	36.00

Plot(s) of Test Data

Plot(s) of Test Data is presented hereinafter as reference.

Conduction Emission

14. Jul 08 23:03

FCC Part15.207

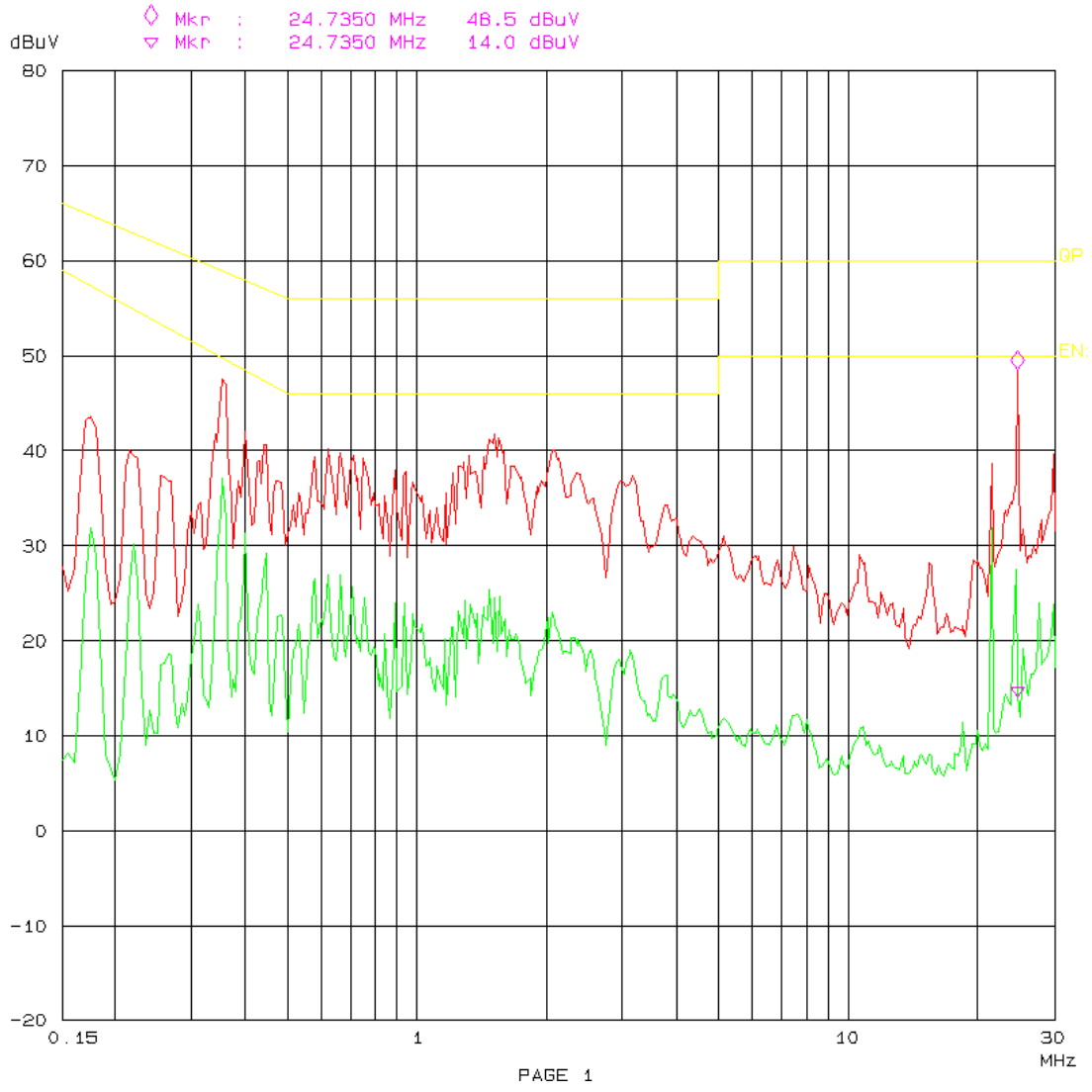
EUT: Bluetooth Speaker phone
Manuf: Infinia M/N:HKT450;NOMAD750;NOMAD760
Op Cond: Charging
Operator: Jim
Test Spec: AC 120V/50Hz hot
Comment: Temp: 25 Hum: 56%

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK+AV	20ms	AUTO	LN OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 8
Acc Margin: 6dB

Transducer	No.	Start	Stop	Name
	3	150k	30M	F_33_2



Conduction Emission

14. Jul 08 22:23

FCC Part15.207

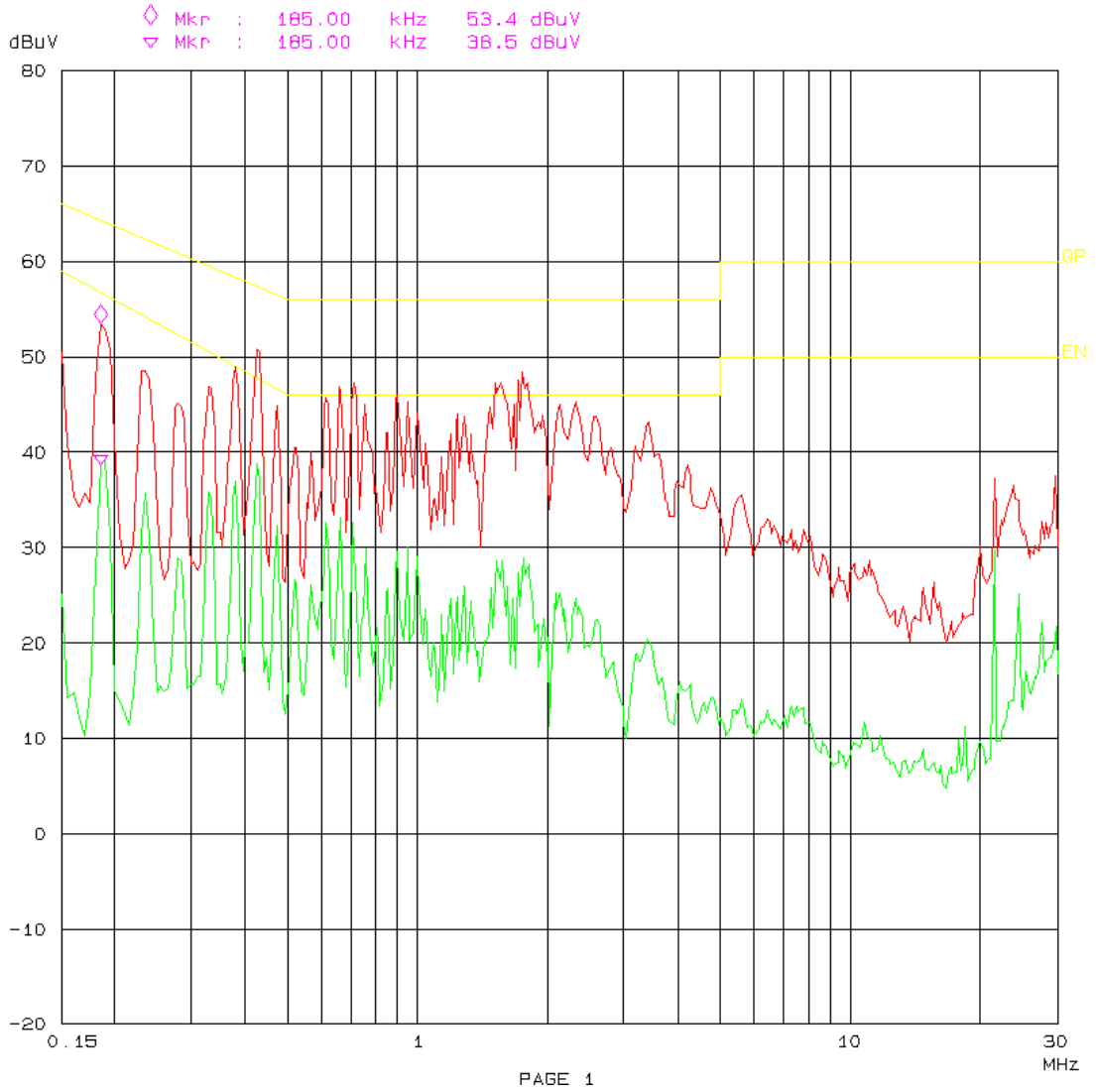
EUT: Bluetooth Speaker phone
Manuf: Infinia M/N:HKT450;NOMAD750;NOMAD760
Op Cond: Charging
Operator: Jim
Test Spec: AC 120V/50Hz neutral
Comment: Temp: 25 Hum: 56%

Scan Settings (1 Range)

Frequencies			Receiver Settings				
Start	Stop	Step	IF BW	Detector	M-Time	Atten	Preamp
150k	30M	5k	9k	PK+AV	20ms	AUTO	LN OFF

Final Measurement: x QP / + AV
Meas Time: 1 s
Subranges: 8
Acc Margin: 6dB

Transducer	No.	Start	Stop	Name
	3	150k	30M	F_33_2



CFR47 §15.205, §15.209, §15.247 - RADIATED EMISSIONS

Applicable Standard

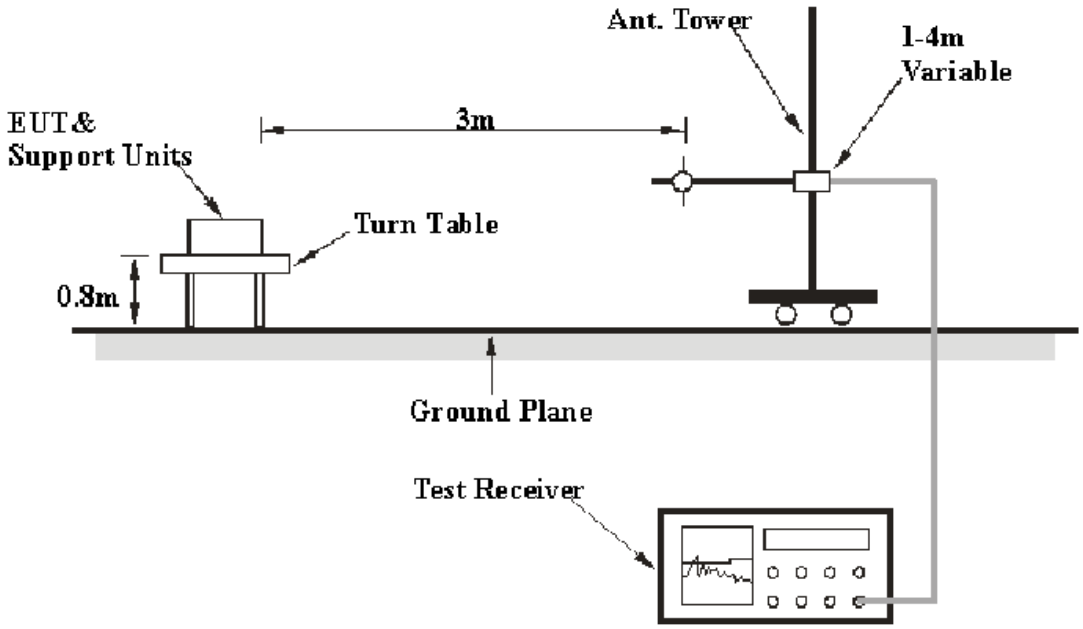
CFR47 §15.205; §15.209; §15.247 (d).

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 Bay Area Compliance Laboratories Corp. (Shenzhen) is ±4.0 dB.

EUT Setup



The radiated emission tests were performed in the 3 meters chamber B test site, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC 15.209 and FCC 15.247 limits.

The external I/O cables were draped along the test table and formed a bundle 30 to 40 cm long in the middle.

The spacing between the peripherals was 10 cm.

The adapter was connected to a 120 VAC/60 Hz power source.

EMI Test Receiver & Spectrum Analyzer Setup

The system was investigated from 30 MHz to 25 GHz.

During the radiated emission test, the EMI test receiver & Spectrum Analyzer Setup were set with the following configurations:

Frequency Range	*RBW*	*Video B/W*
30MHz – 1000 MHz	100 kHz	300 kHz
1000 MHz – 25 GHz	1 MHz	3 MHz

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2007-11-15	2008-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2008-03-11	2009-03-11
HP	Amplifier	8449B	3008A00277	2007-09-29	2008-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2007-09-25	2008-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-05-09	2009-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

For the radiated emissions test, the adapter was connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

Data was recorded in Quasi-peak detection mode for frequency range of 30 MHz-1GHz and peak and Average detection modes for frequencies above 1GHz.

Corrected Amplitude & Margin Calculation

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

Corrected Amplitude = Meter Reading + Antenna Factor + Cable Loss- 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. The equation for margin calculation is as follows:

Margin = Limit - Corrected Amplitude

Test Results Summary

According to the recorded data in following table, the EUT complied with the FCC Title 47, Part 15, Subpart C, section 15.205, 15.209, and 15.247, with the worst margin reading of:

Transmitting mode (30 – 1000 MHz):

11.3 dB at **947.682 MHz** in the **Vertical** polarization

Transmitting mode (Above 1 GHz):

4.24 dB at **1602 MHz** in the **Vertical** polarization **(Low Channel)**
9.81 dB at **4882 MHz** in the **Horizontal** polarization **(Middle Channel)**
3.74 dB at **1652 MHz** in the **Vertical** polarization **(High Channel)**

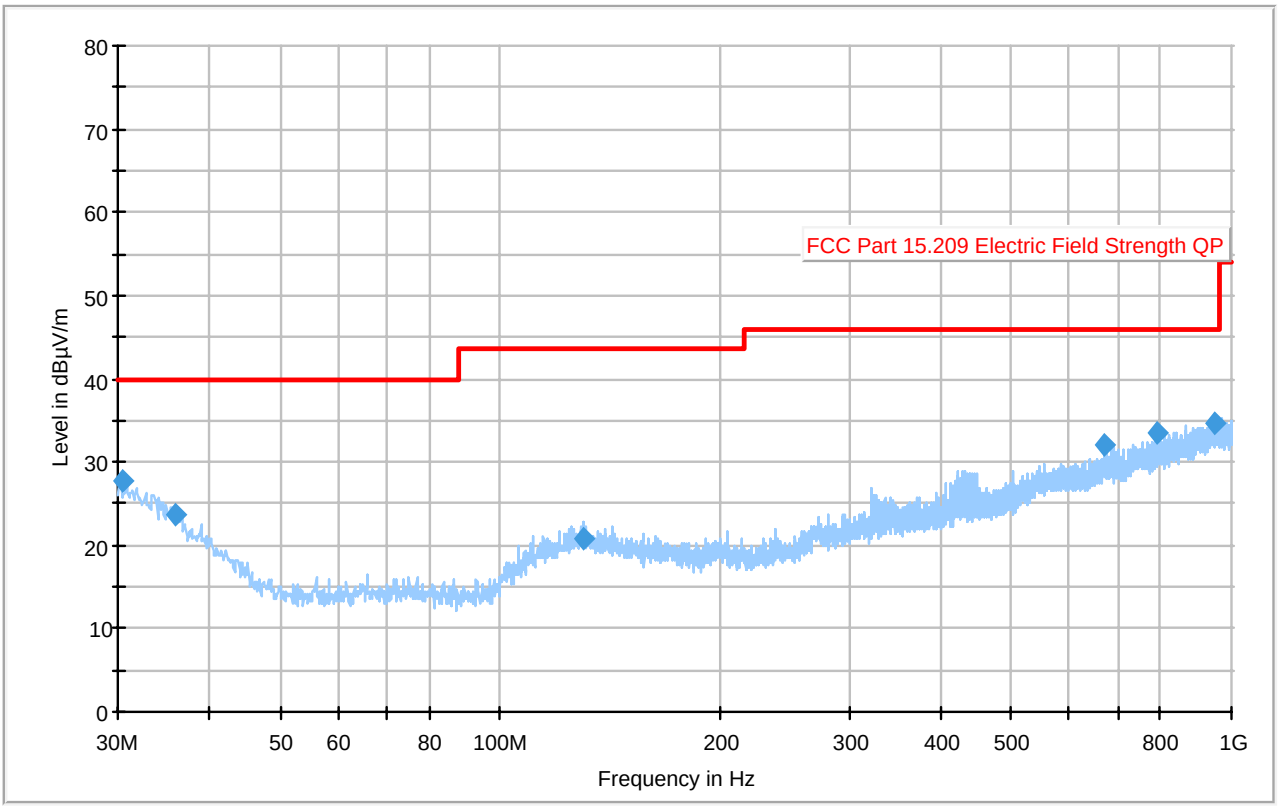
Test Data

Environmental Conditions

Temperature:	25 ° C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Jim Li on 2008-07-20

Test Mode: Transmitting (30 – 1000 MHz)



Frequency (MHz)	Corrected Amp. (dBµV/m)	Antenna Height (cm)	Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBµV/m)	Margin (dB)
947.682000	34.7	263.0	V	146.0	1.9	46.0	11.3
30.368144	27.7	370.0	V	224.0	-4.2	40.0	12.3
790.052062	33.5	395.0	V	53.0	-0.5	46.0	12.5
668.922000	32.1	352.0	V	158.0	-2.3	46.0	13.9
35.961875	23.7	383.0	V	54.0	-8.2	40.0	16.3
129.689375	20.9	203.0	H	294.0	-10.3	43.5	22.6

Test Mode: Transmitting (Above 1GHz)

Freq. (MHz)	Meter Reading (dBuV)	Detector PK/QP/AV	Direction Degree	Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Corr. Amp. (dBuV/m)	FCC Part 15.247/209		
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBuV/m)	Margin (dB)	Remarks
Low Channel (2402 MHz)												
1602	50.74	AV	180	1.3	V	27.8	5.62	34.4	49.76	54	4.24	spurious
4804	39.62	AV	90	1.0	V	34.7	7.56	33.7	48.18	54	5.82	harmonic
1602	45.51	AV	120	1.2	H	27.8	5.62	34.4	44.53	54	9.47	spurious
4804	34.21	AV	90	1.0	H	34.6	7.56	33.7	42.67	54	11.33	harmonic
1602	59.9	PK	180	1.3	V	27.8	5.62	34.4	58.92	74	15.08	spurious
1602	58.68	PK	120	1.2	H	27.8	5.62	34.4	57.7	74	16.3	spurious
4804	45.56	PK	90	1.2	V	34.7	7.56	33.7	54.12	74	19.88	harmonic
4804	41.32	PK	180	1.3	H	34.7	7.56	33.7	49.88	74	24.12	harmonic
Middle Channel (2441 MHz)												
4882	38.55	AV	142	1.1	H	34.7	4.64	33.7	44.19	54	9.81	harmonic
4882	38.63	AV	243	1.0	V	34.6	4.64	33.7	44.17	54	9.83	harmonic
1626.5	39.85	AV	135	1.3	H	27.8	1.20	34.4	34.45	54	19.55	spurious
1626.5	39.26	AV	85	1.0	V	27.8	1.20	34.4	33.86	54	20.14	spurious
4882	42.14	PK	153	1.5	V	34.6	4.64	33.7	47.68	74	26.32	harmonic
4882	41.33	PK	234	1.0	H	34.7	4.64	33.7	46.97	74	27.03	harmonic
1626.5	42.66	PK	265	1.4	V	27.8	1.20	34.4	37.26	74	36.74	spurious
1626.5	41.57	PK	156	1.2	H	27.8	1.20	34.4	36.17	74	37.83	spurious
High Channel (2480 MHz)												
1652	51.24	AV	156	1.2	V	27.8	5.62	34.4	50.26	54	3.74*	harmonic
1652	47.72	AV	156	1.2	H	27.5	5.62	34.4	46.44	54	7.56	harmonic
1652	56.40	PK	128	1.5	V	27.8	5.62	34.4	55.42	74	18.58	harmonic
1652	52.97	PK	128	1.5	H	27.5	5.62	34.4	51.69	74	22.31	spurious
4960	38.61	PK	145	1.2	H	34.6	4.55	33.7	44.06	74	29.94	spurious
4960	41.24	PK	142	1.4	V	34.7	4.55	33.7	46.79	74	27.21	harmonic
4960	33.82	AV	142	1.1	V	34.7	4.55	33.7	39.37	54	14.63	spurious
4960	33.02	AV	256	1.3	H	34.6	4.55	33.7	38.47	54	15.53	spurious

*Within measurement uncertainty.

CFR47 §15.247(a) (1)-CHANNEL SEPARATION TEST

Applicable Standard

Frequency hopping systems shall have hoping channel carrier frequencies separated by a minimum of 25 kHz or the 20dB bandwidth of the hopping channel, whichever is greater. Alternatively, frequency hopping systems operating in the 2400-2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20dB bandwidth of the hopping channel, whichever is greater provided the systems operate with an output power no greater than 125 mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

1. Set the EUT in transmitting mode, spectrum Bandwidth was set at 100 kHz, maxhold the channel.
2. Set the adjacent channel of the EUT maxhold another truce
3. Measure the channel separation.

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Jim Li on 2008-07-14.

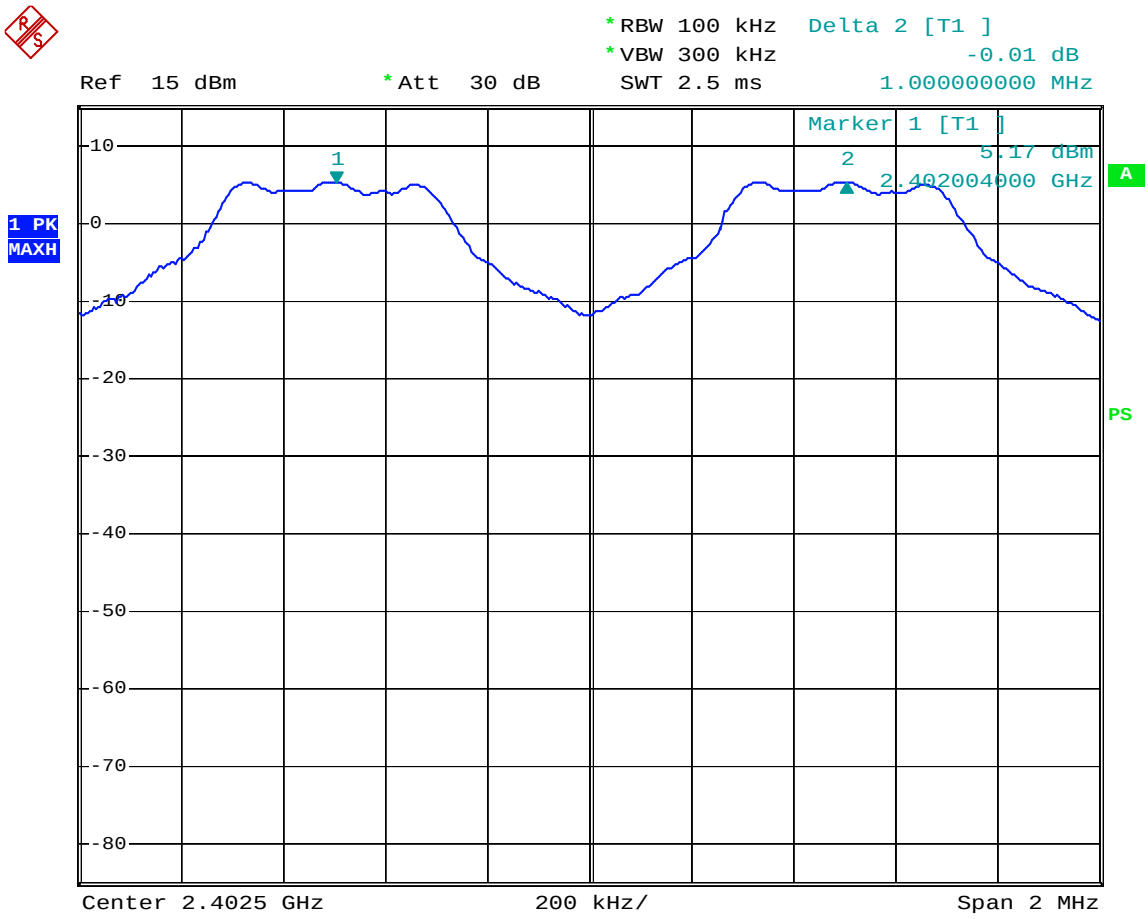
Test Mode: Transmitting

Channel	Channel Frequency (MHz)	Channel Separation (MHz)	Limit (MHz)	Result
Low Channel	2402	1	0.67	Pass
Adjacent Channel	2403			
Mid Channel	2441	1	0.67	Pass
Adjacent Channel	2442			
High Channel	2480	1	0.67	Pass
Adjacent Channel	2479			

Test Result: Compliant.

Please refer to following plots

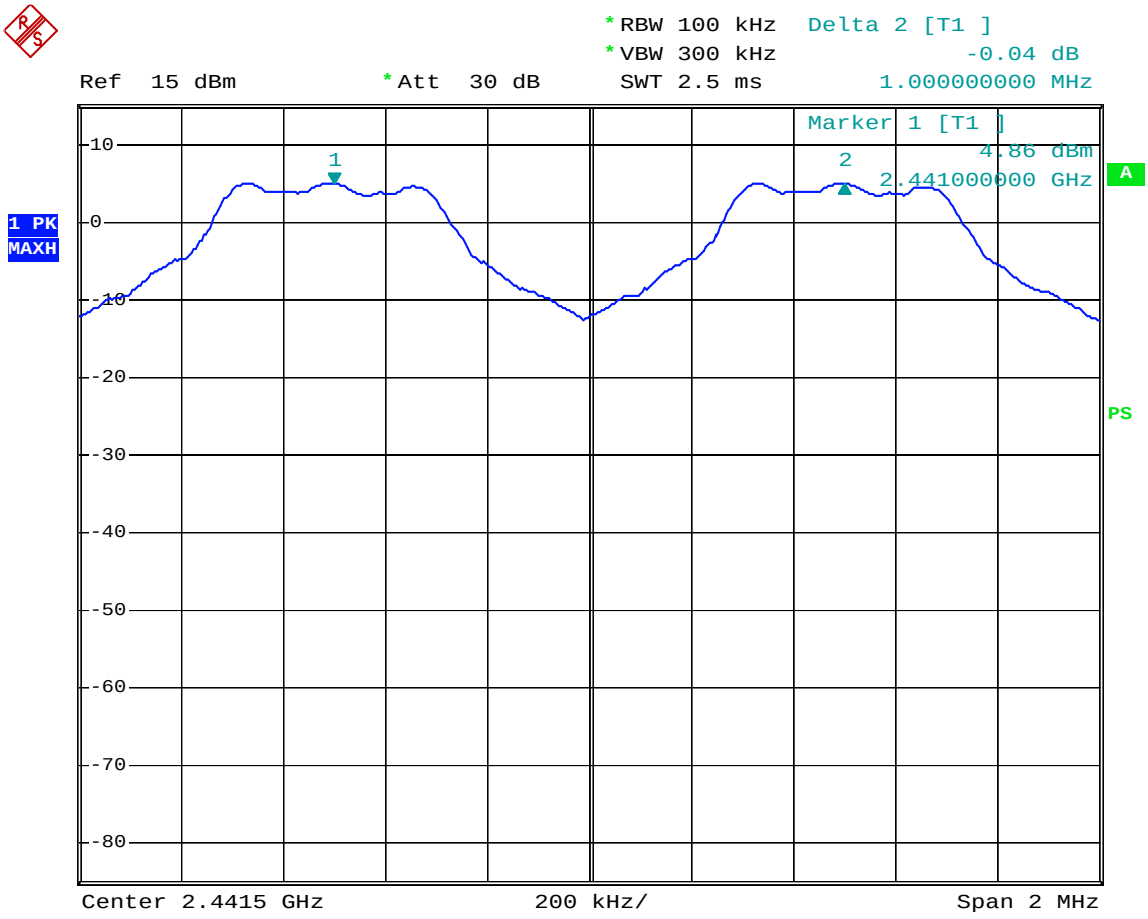
Low Channel



channel separation low channel

Date: 14.JUL.2008 19:23:05

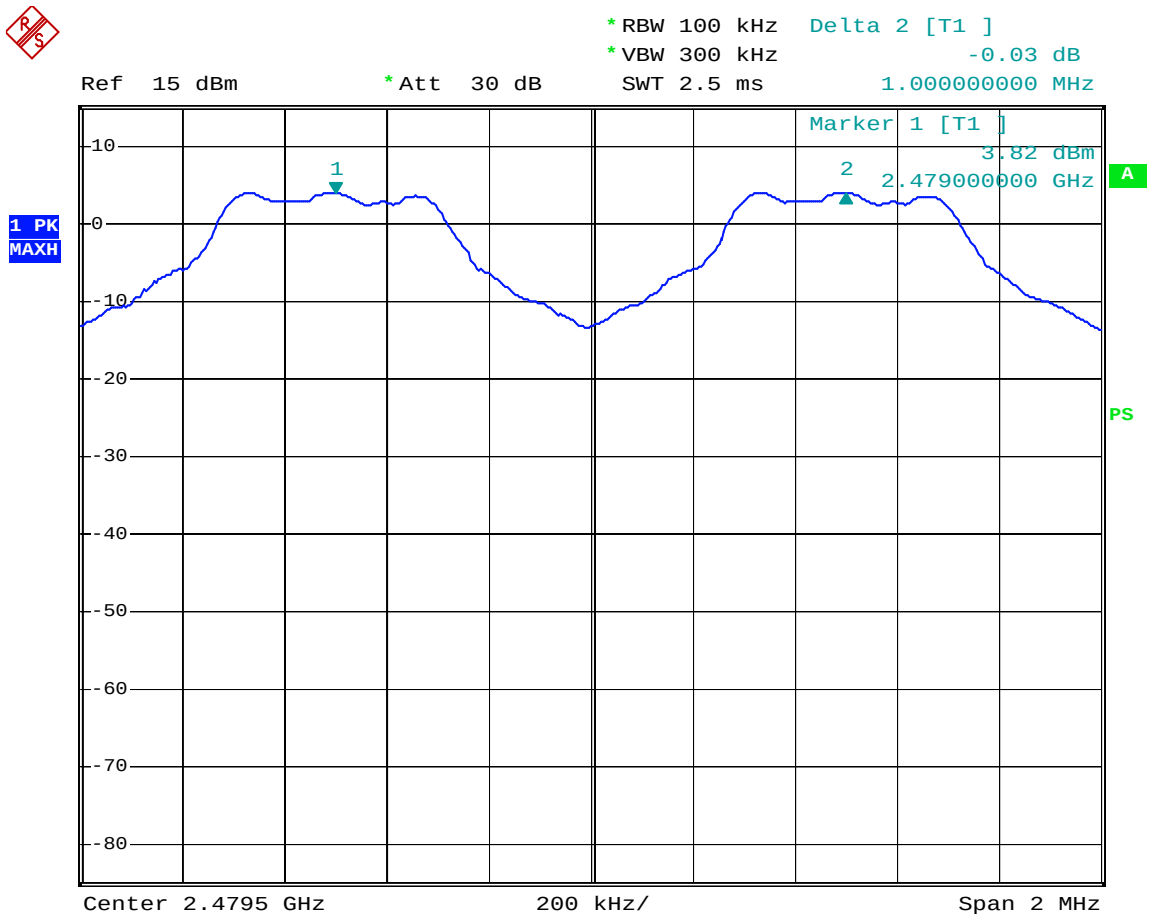
Middle Channel



channel separation middle channel

Date: 14.JUL.2008 19:21:32

High Channel



channel separation high channel

Date: 14.JUL.2008 19:11:03

CFR47 §15.247(a) (1) – 20dB BANDWIDTH TESTING

Applicable Standard

Alternatively, frequency hopping systems operating in the 2400–2483.5 MHz band may have hopping channel carrier frequencies that are separated by 25 kHz or two-thirds of the 20 dB bandwidth of the hopping channel, whichever is greater, provided the systems operate with an output power no greater than 125mW.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT 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 Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

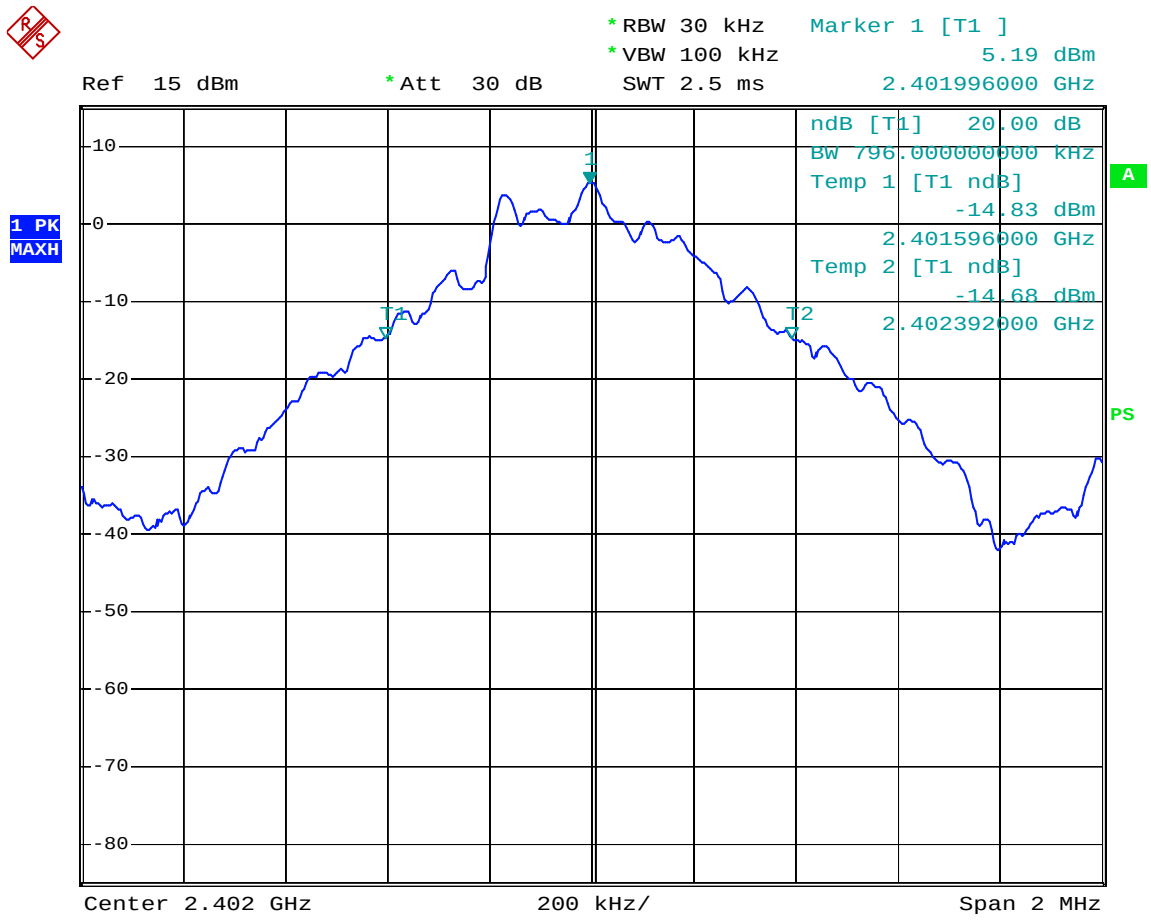
The testing was performed by Jim Li on 2008-07-14.

Test Result: Please refer to the following table and plots.

Test Mode: Transmitting

Channel	Channel Frequency (MHz)	20dB Bandwidth (MHz)
Low	2402	0.796
Middle	2441	0.800
High	2480	0.796

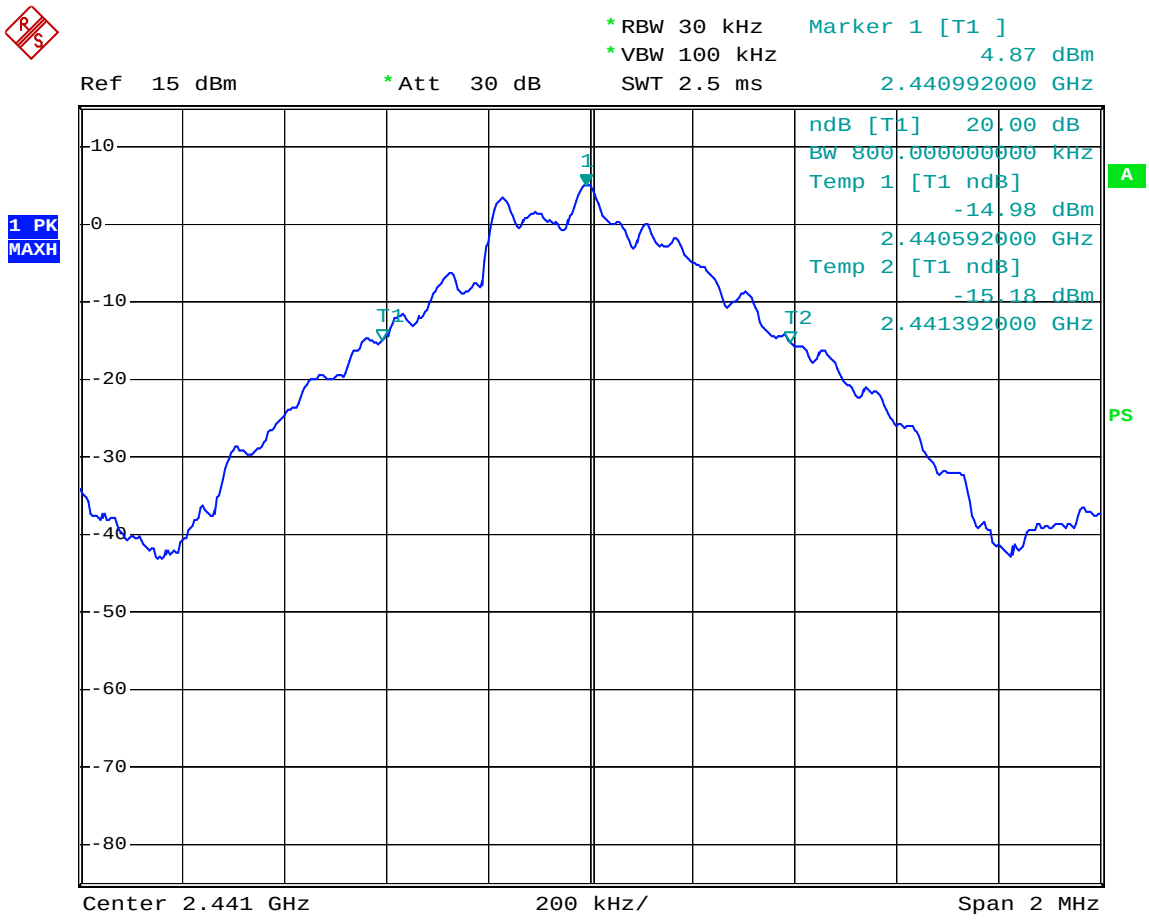
Low Channel



20dB low channel

Date: 14.JUL.2008 19:02:29

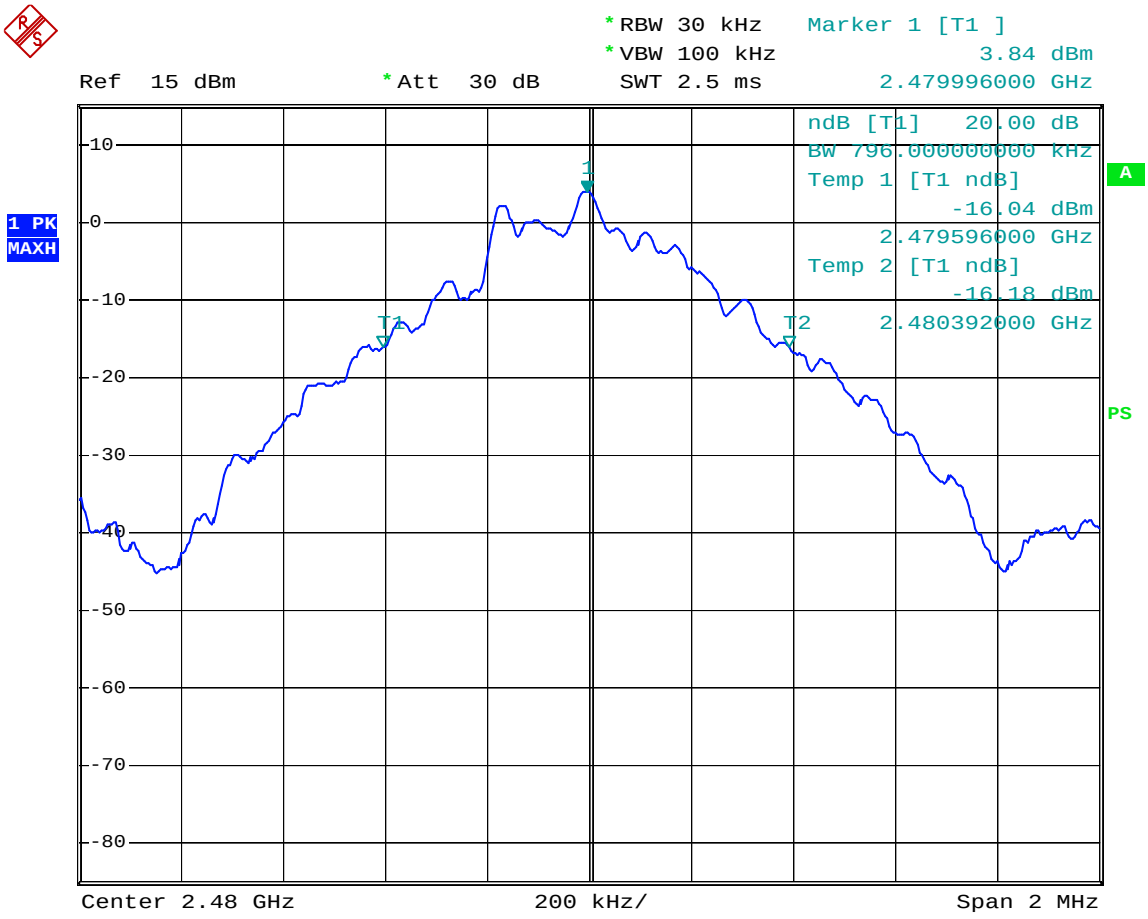
Middle Channel



20dB middle channel

Date: 14.JUL.2008 19:03:55

High Channel



20dB high channel

Date: 14.JUL.2008 19:04:47

CFR47 §15.247(a) (1) (iii)-QUANTITY OF HOPPING CHANNEL TEST

Applicable Standard

Frequency hopping systems in the 2400–2483.5 MHz band shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

1. Check the calibration of the measuring instrument (SA) using either an internal calibrator or a known signal from an external generator.
2. Set the EUT in transmitting mode from first channel to last.
3. By using the Max-Hold function record the Quantity of the channel.

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Jim Li on 2008-07-14.

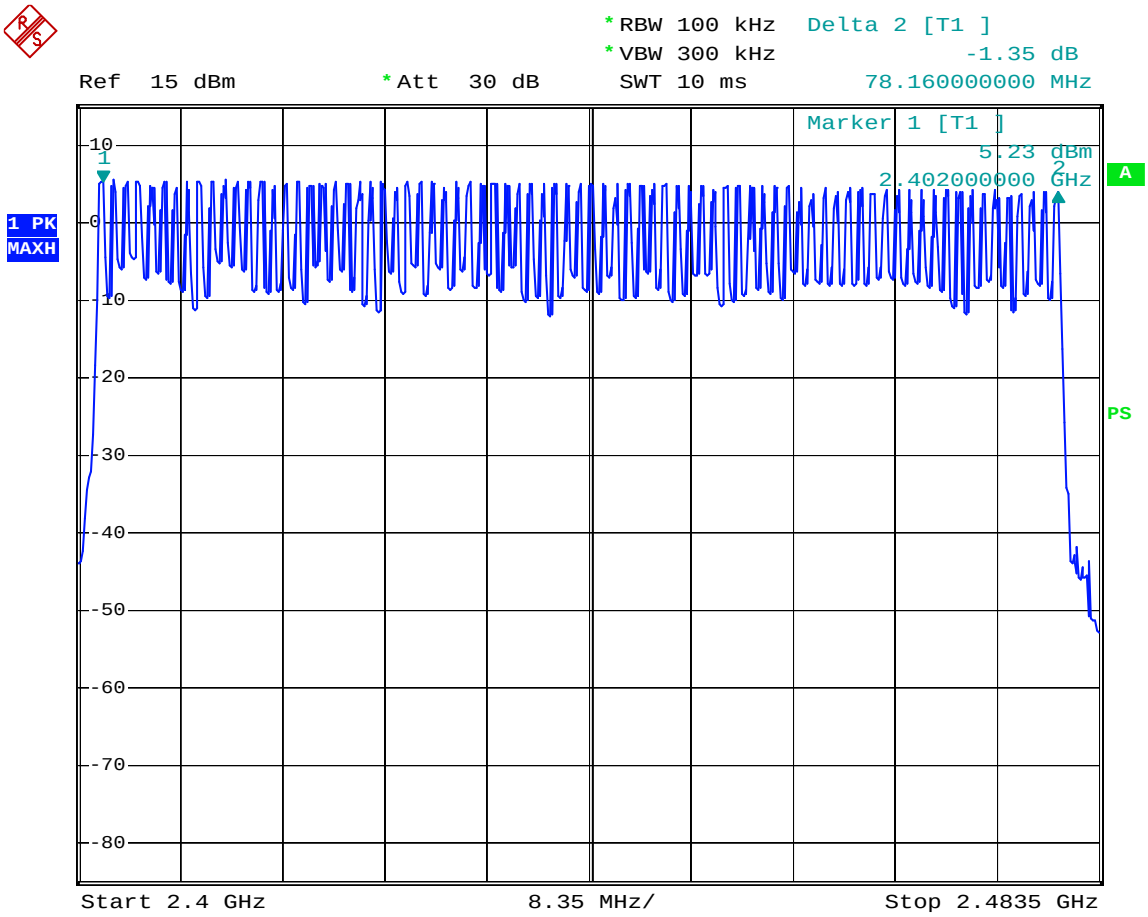
Test Mode: Transmitting

Test Result: Compliant.

Please refer to following plot.

Frequency Range (MHz)	Number of Hopping Channel	Limit
2400-2483.5	79	≥15

Number of Hopping Channels



[redacted] hopping channel quantity

Date: 14.JUL.2008 19:37:45

CFR47 §15.247(a) (1) (iii) -TIME OF OCCUPANCY (DWELL TIME)

Applicable Standard

Frequency hopping systems in the 2400-2483.5 MHz shall use at least 15 channels. 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. Frequency hopping systems may avoid or suppress transmissions on a particular hopping frequency provided that a minimum of 15 channels are used.

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

The EUT was worked in channel hopping; Spectrum SPAN was set as 0. Sweep was set as 0.4 X channel no. (s), the quantity of pulse was get from single sweep. In addition, the time of single pulses was tested.

Dwell Time= time slot length * hope rate/ number of hopping channels * 31.6s
Hop rate=1600/s

Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Jim Li on 2008-07-14.

Test Result: Compliant.

Please refer to following tables and plots

Test Mode: Transmitting

DH 1

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low	0.540	0.173	0.4	Pass
Middle	0.540	0.173	0.4	Pass
High	0.540	0.173	0.4	Pass

NOTE: Dwell time=Pulse width (ms) × (1600 ÷ 2 ÷ 79) ×31.6 Second

DH 3

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low Channel	1.81	0.290	0.4	Pass
Mid Channel	1.81	0.290	0.4	Pass
High Channel	1.81	0.290	0.4	Pass

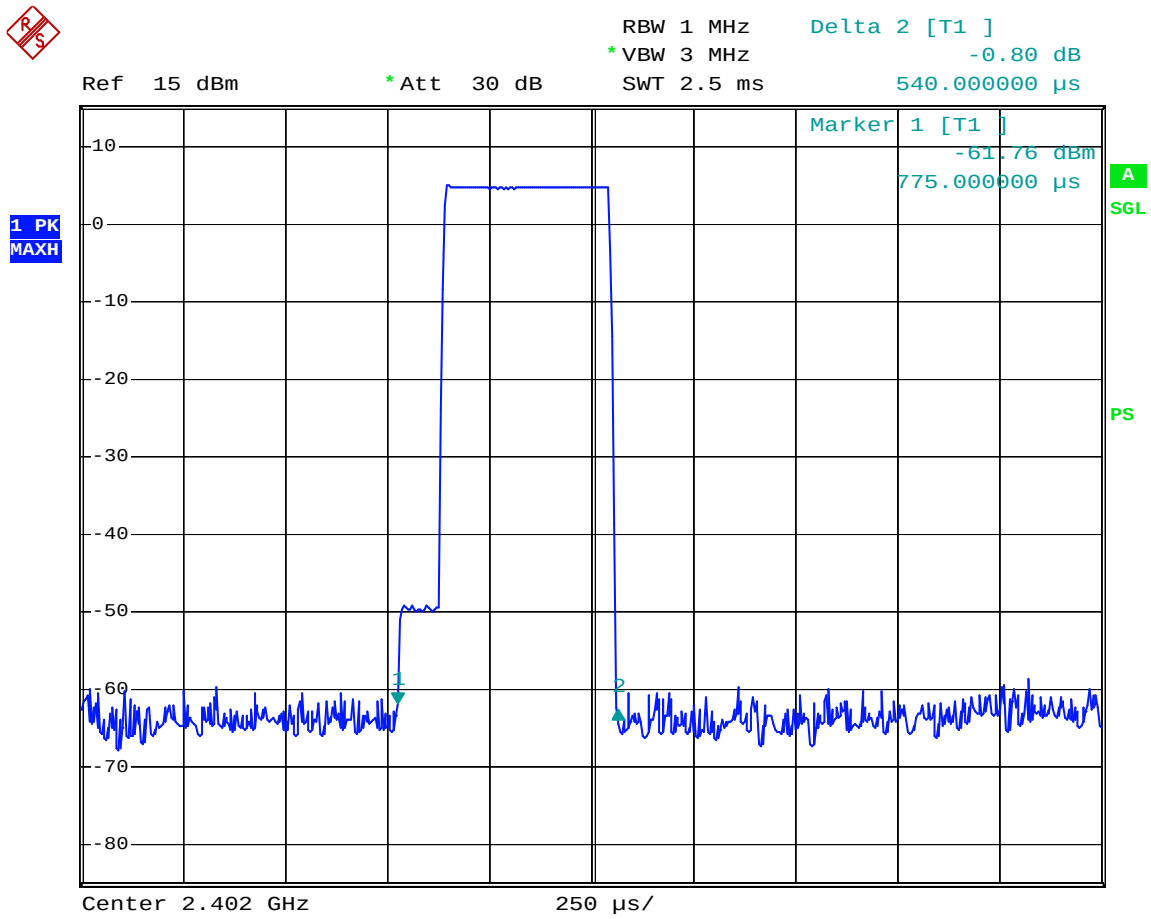
NOTE: Dwell time=Pulse width (ms) × (1600 ÷ 4 ÷ 79) ×31.6 Second

DH 5

Channel	Pulse width (ms)	Dwell time (s)	Limit (s)	Result
Low Channel	3.072	0.328	0.4	Pass
Mid Channel	3.072	0.328	0.4	Pass
High Channel	3.072	0.328	0.4	Pass

NOTE: Dwell time=Pulse width (ms) × (1600 ÷ 6 ÷ 79) ×31.6 Second

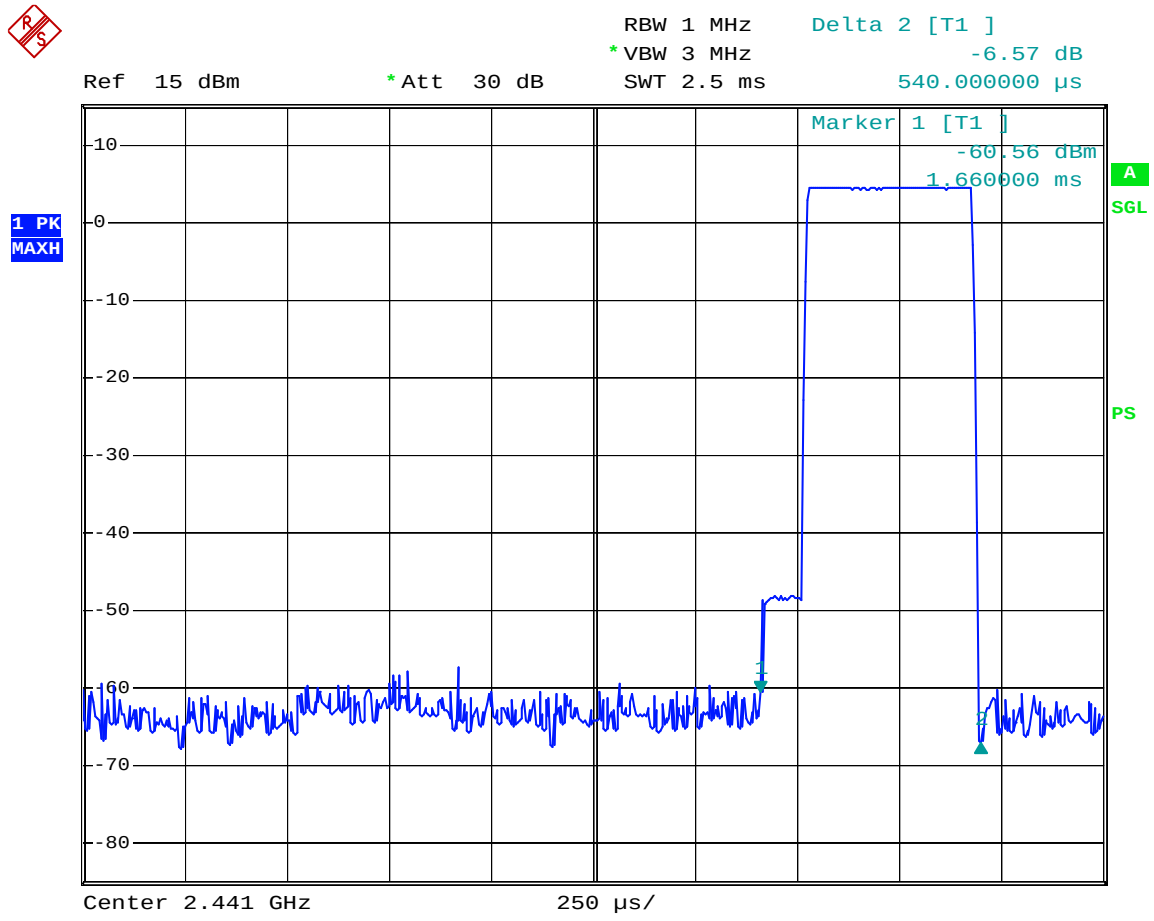
Low Channel for DH1



dwell time low channel

Date: 14.JUL.2008 19:44:06

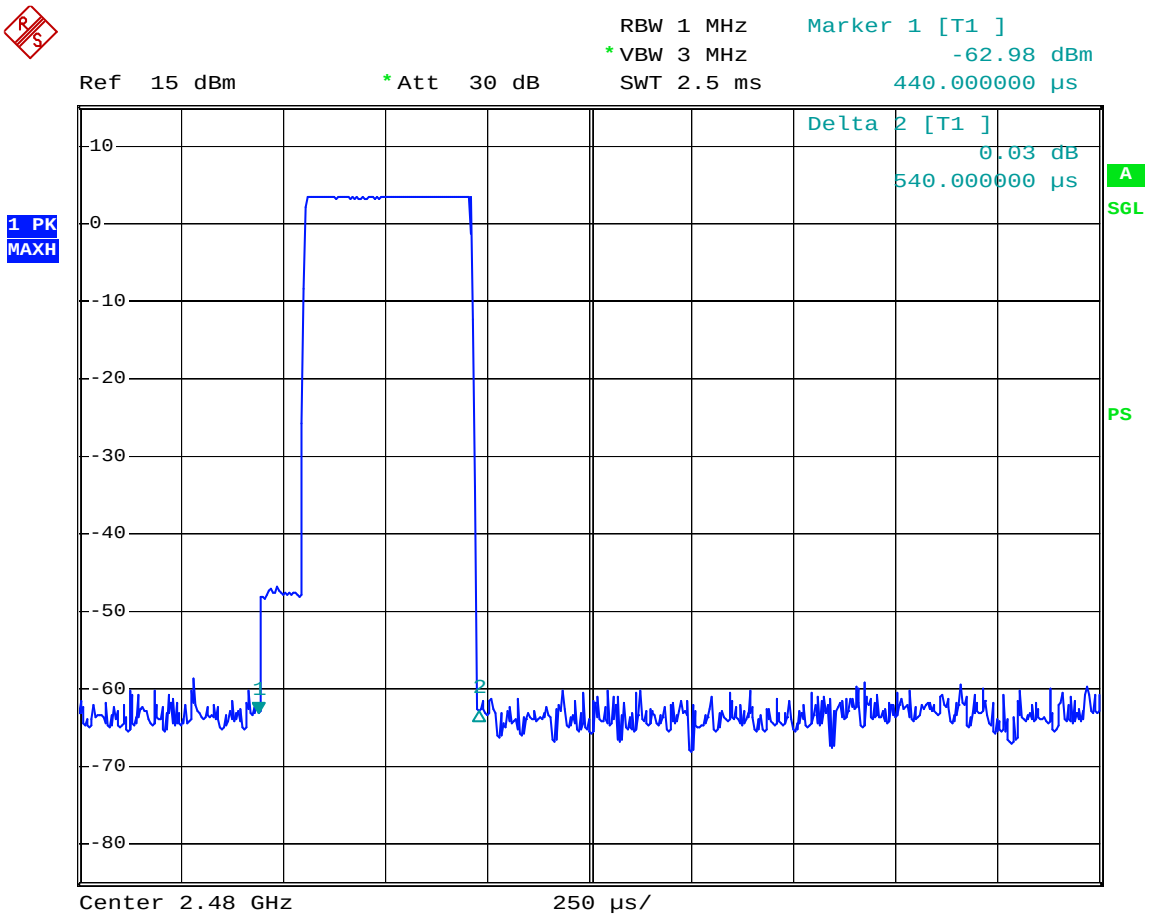
Middle Channel for DH1



dwell time middle channel

Date: 14.JUL.2008 19:46:07

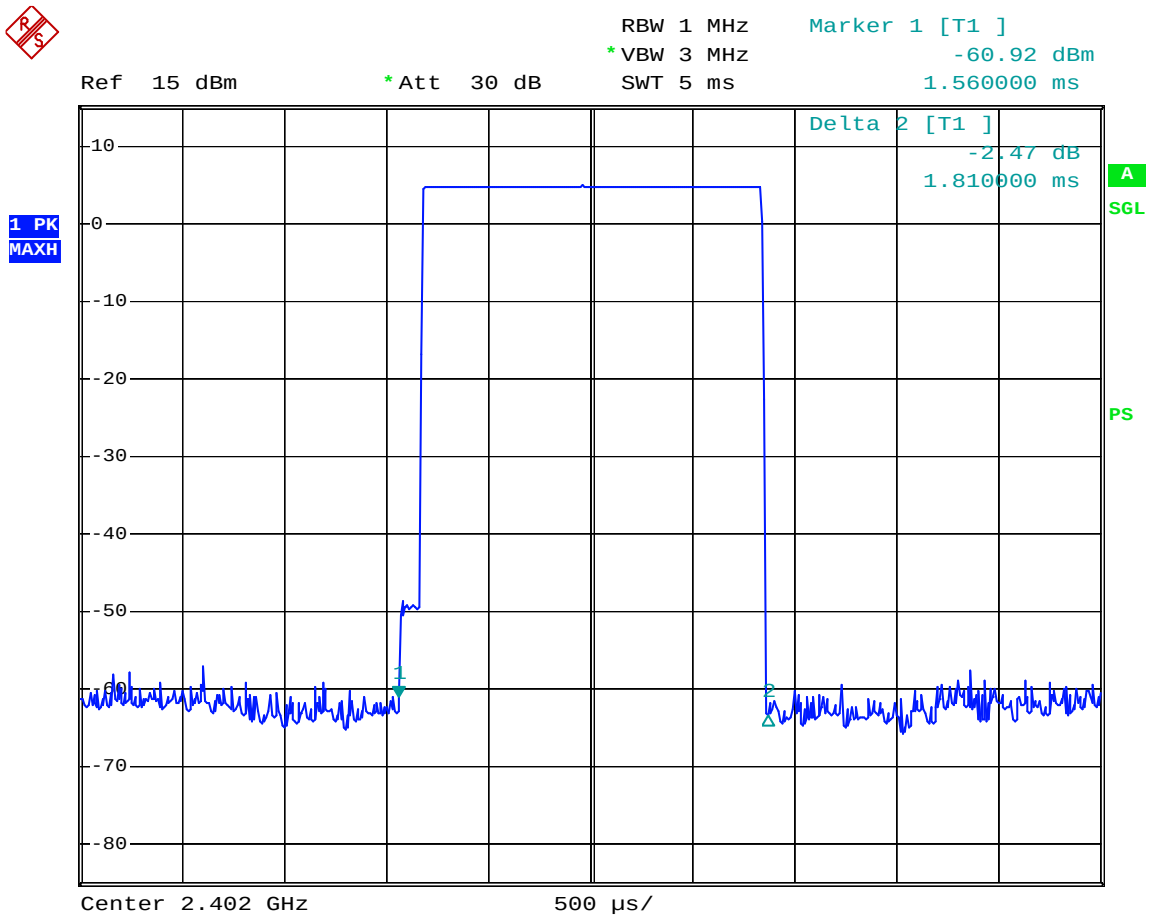
High Channel for DH1



dwell time high channel

Date: 14.JUL.2008 19:48:00

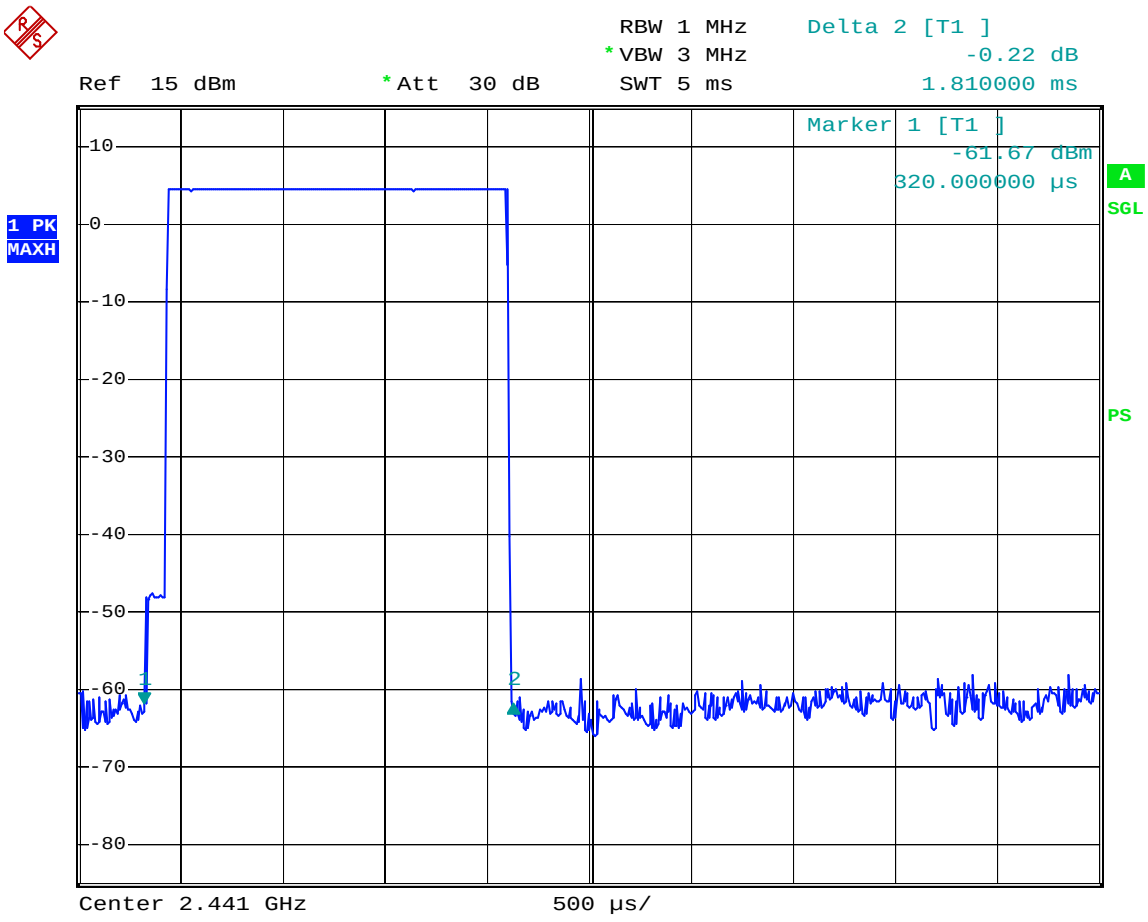
Low Channel for DH3



dwell time low channel-DH3

Date: 14.JUL.2008 20:02:19

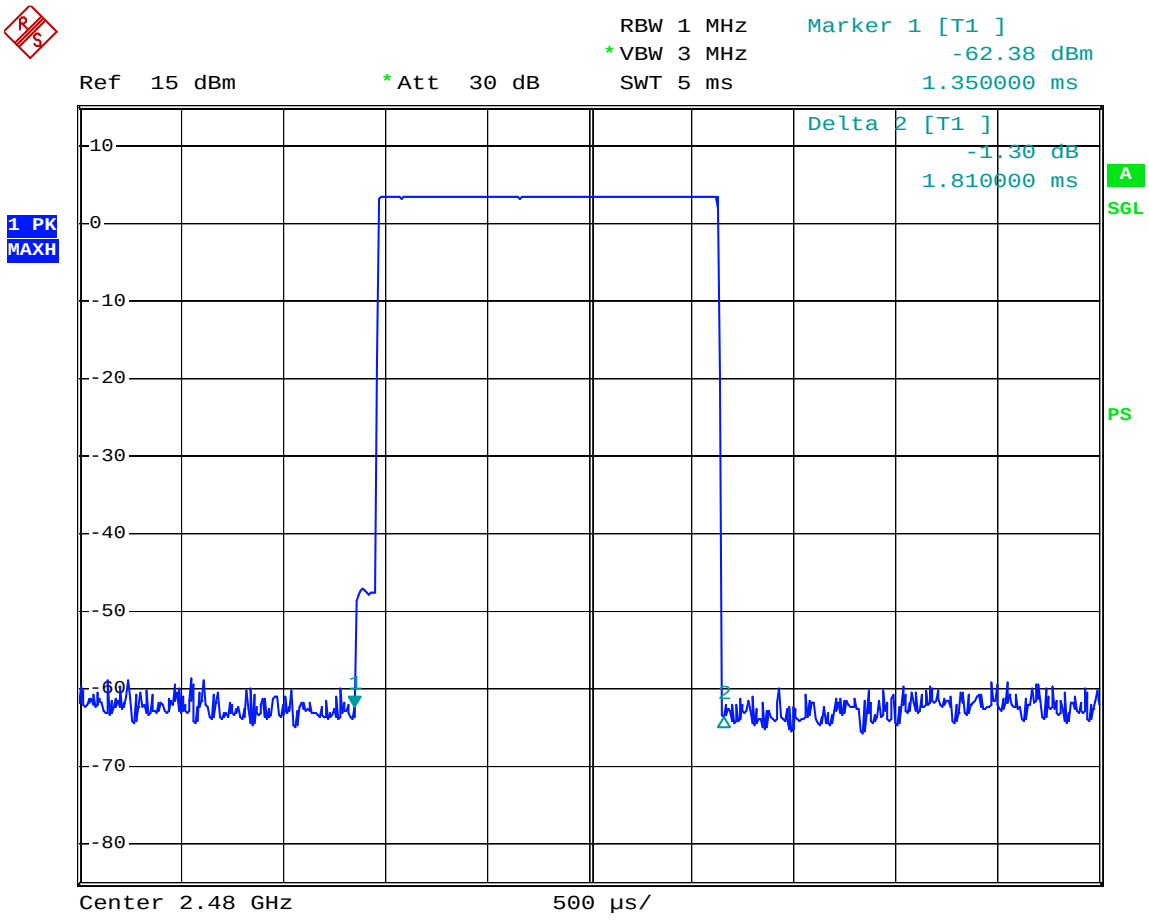
Middle Channel for DH3



dwell time middle channel-DH3

Date: 14.JUL.2008 20:01:02

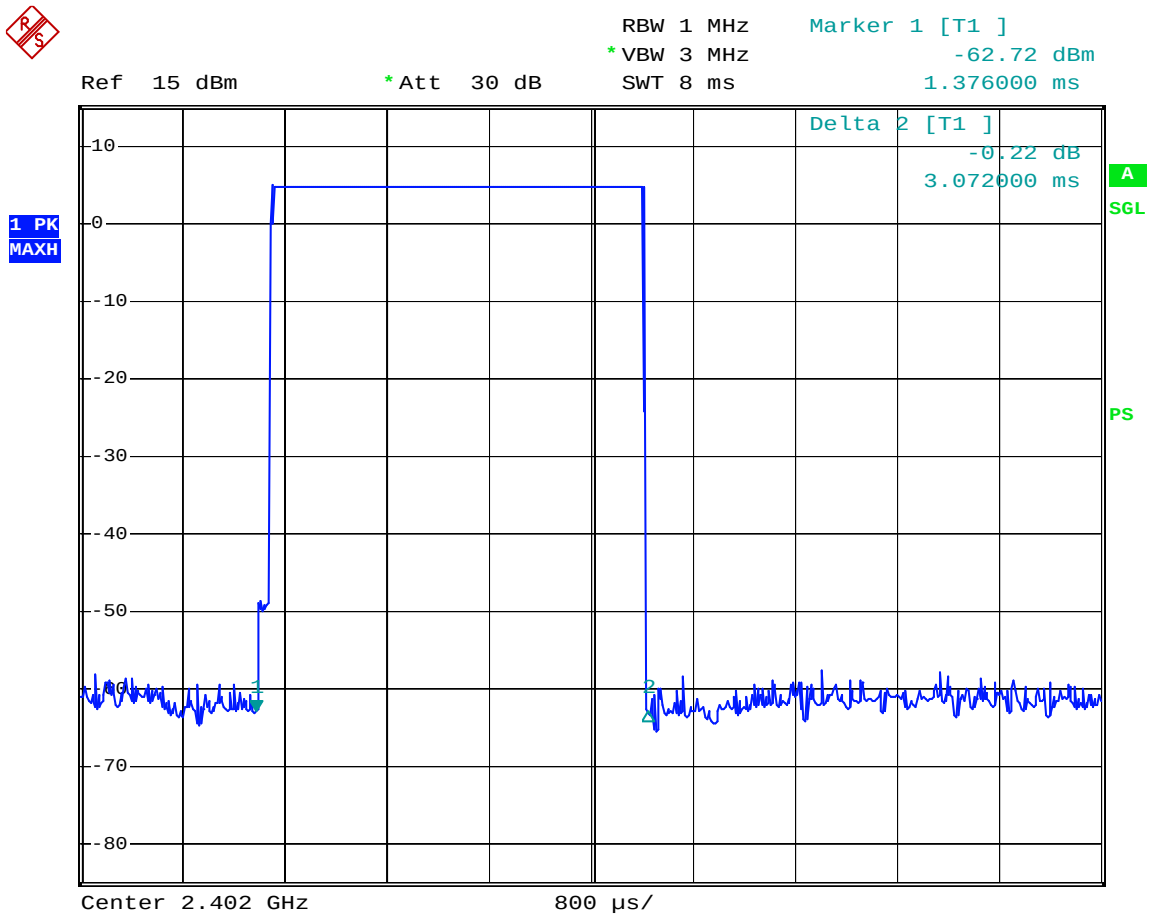
High Channel for DH3



dwell time high channel-DH3

Date: 14.JUL.2008 19:58:26

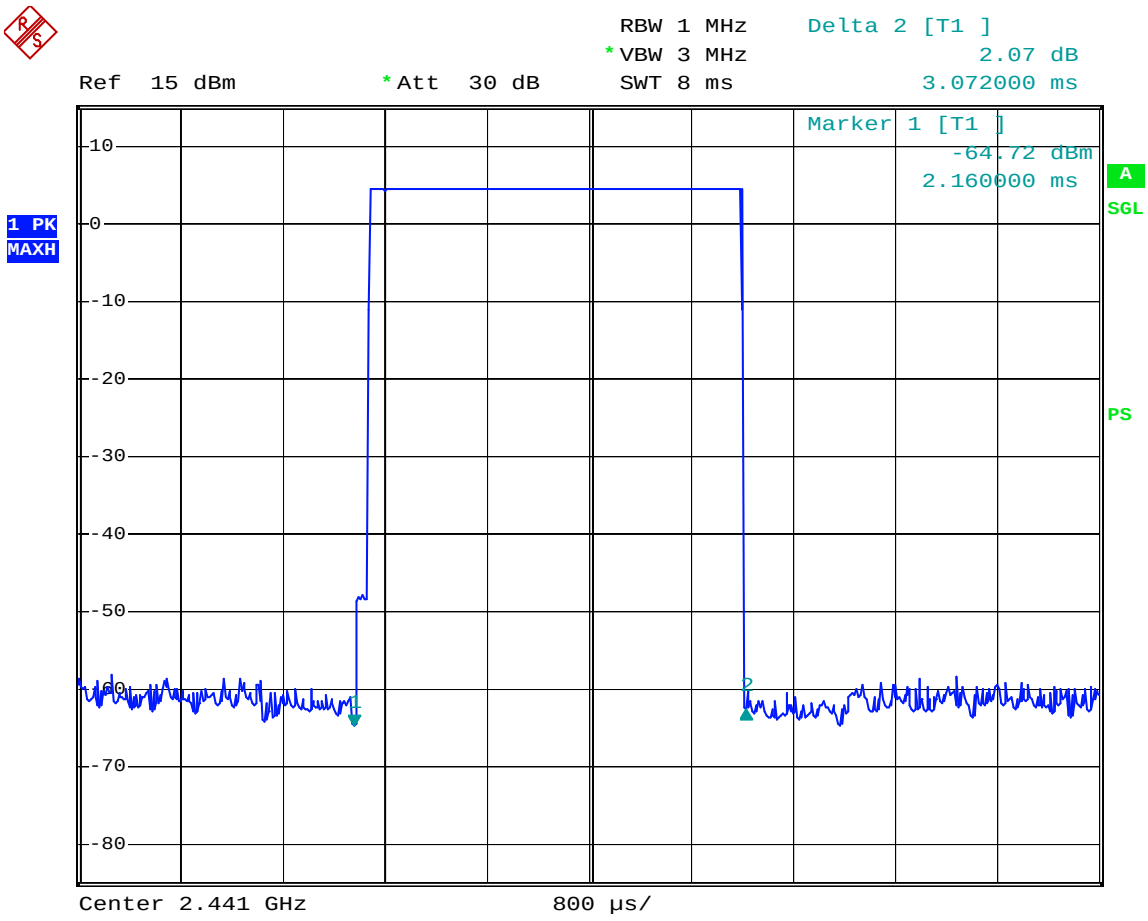
Low Channel for DH5



dwell time low channel-DH5

Date: 14.JUL.2008 20:05:57

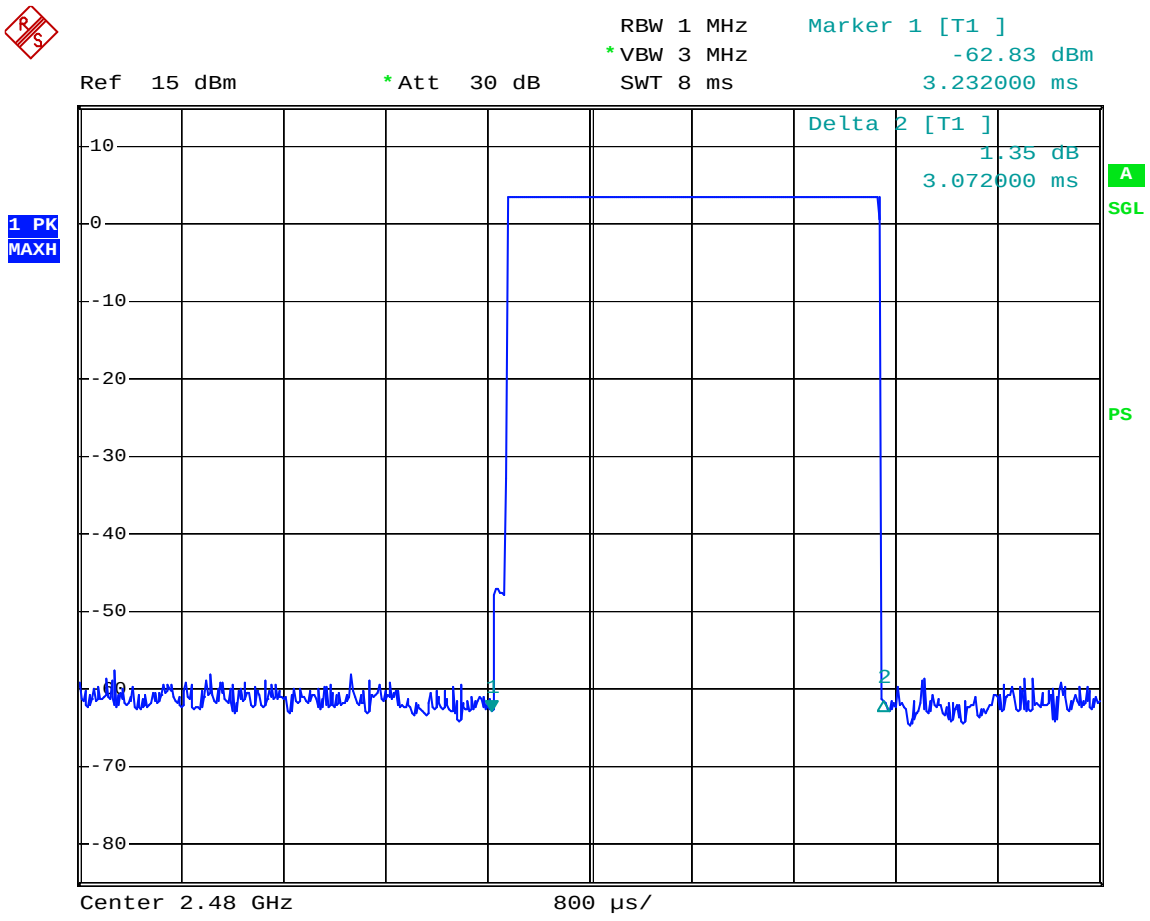
Middle Channel for DH5



dwell time middle channel-DH5

Date: 14.JUL.2008 20:07:04

High Channel for DH5



dwell time high channel-DH5

Date: 14.JUL.2008 20:08:09

CFR47 §15.247(b) (1) - PEAK OUTPUT POWER MEASUREMENT

Applicable Standard

According to §15.247(b) (1), for frequency hopping systems operating in the 2400–2483.5 MHz band employing at least 75 non-overlapping hopping channels, and all frequency hopping systems in the 5725-5850 MHz band: 1 watt. For all other frequency hopping systems in the 2400–2483.5 MHz band: 0.125 watts.

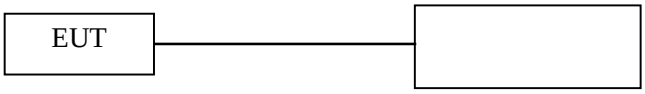
Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2007-11-15	2008-11-15
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16
HP	Amplifier	8449B	3008A00277	2007-09-29	2008-09-29
Sunol Sciences	Horn Antenna	DRH-118	A052604	2007-09-25	2008-09-25
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2008-05-09	2009-05-09

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

1. Place the EUT on a bench 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 an EMI Test Receiver.
3. Add a correction factor to the display.



Test Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Jim Li on 2008-07-25.

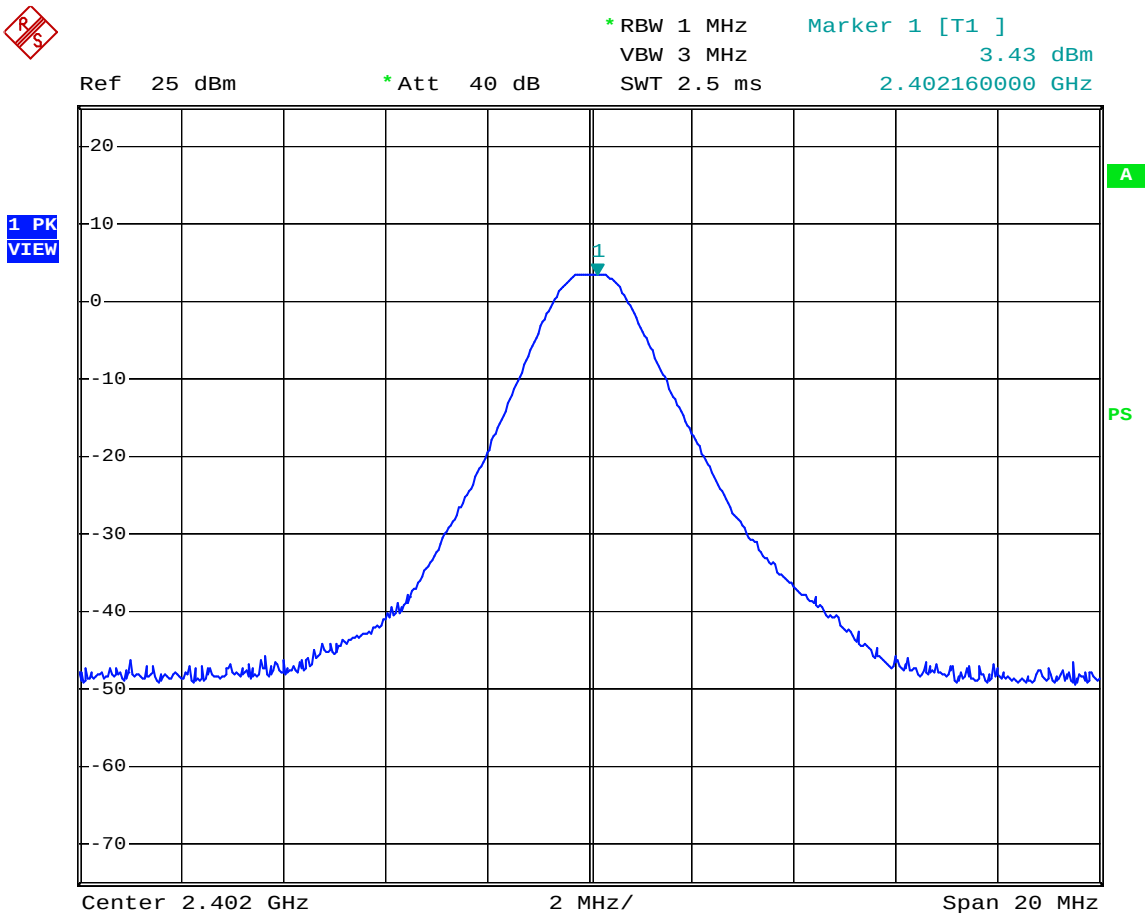
Test Mode: Transmitting

Test Result: Compliant.

Please refer to following tables and plots

Channel	Channel Frequency (MHz)	Power Output		Limit (w)
		(dBm)	(mw)	
Low Channel	2402	3.43	2.203	1
Mid Channel	2441	2.74	1.879	1
High Channel	2480	3.21	2.094	1

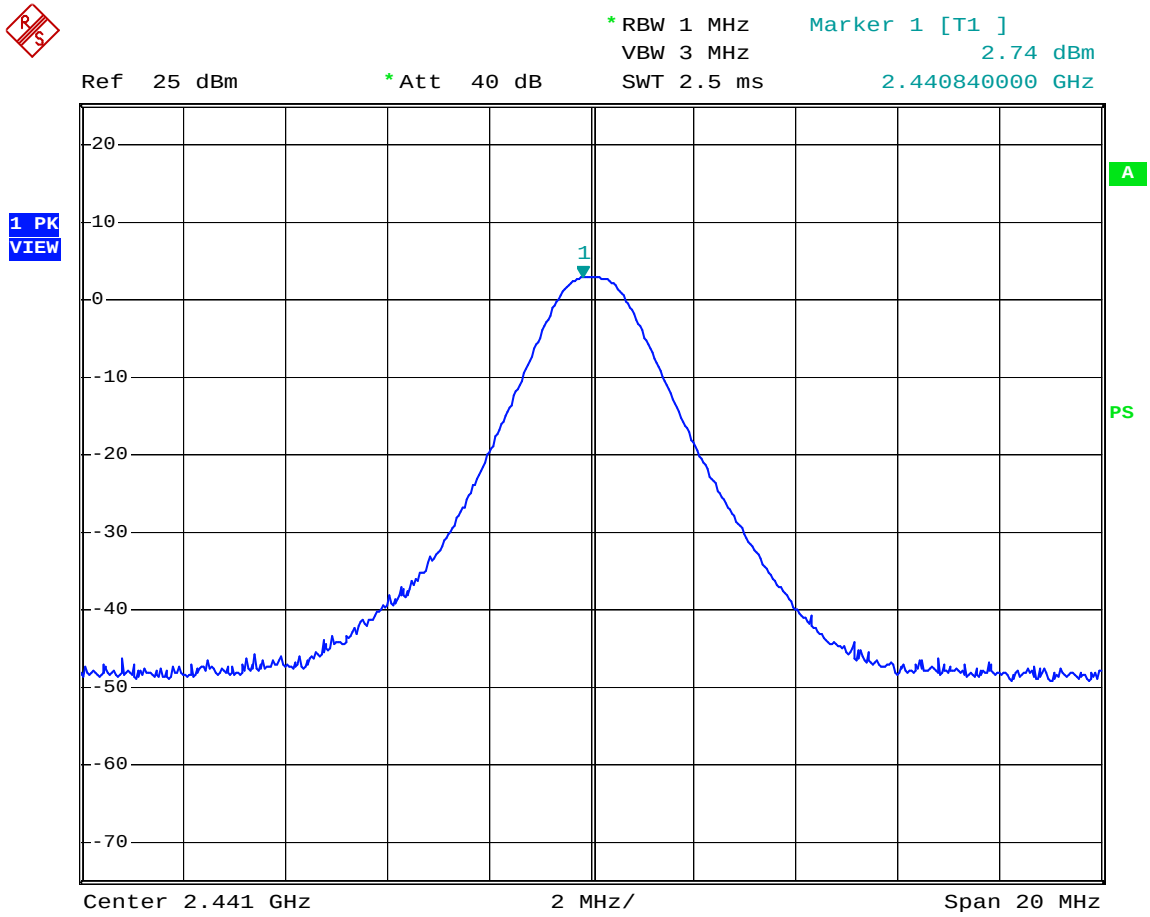
Low Channel



Peak output power low channel

Date: 25.JUL.2008 22:29:08

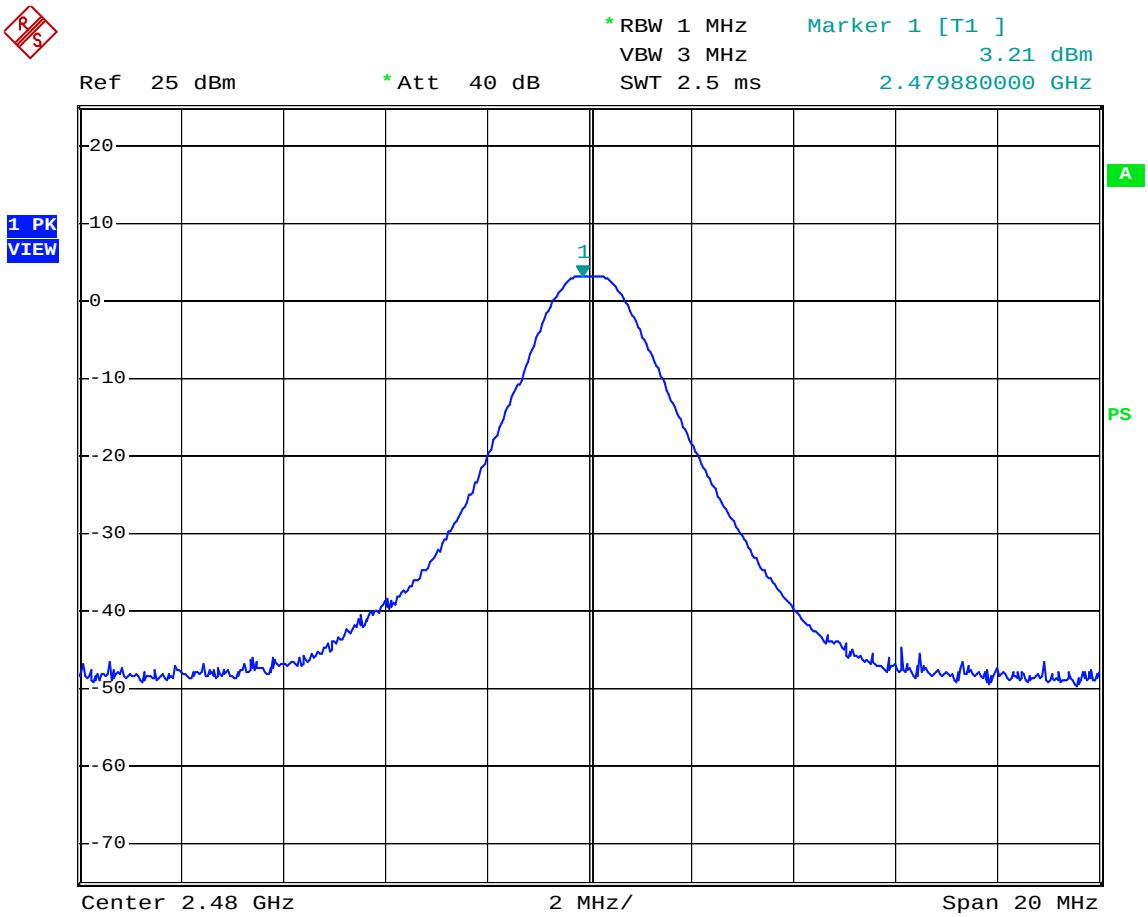
Middle Channel



Peak output power middle channel

Date: 25.JUL.2008 22:30:31

High Channel



Peak output power high channel

Date: 25.JUL.2008 22:33:32

CFR47 §15.247(d) - BAND EDGES TESTING

Applicable Standard

In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated 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, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2007-10-16	2008-10-16

*** Statement of Traceability:** Bay Area Compliance Laboratories Corp. (Shenzhen) attests that all calibrations have been performed in accordance to NVLAP requirements, traceable to the NIST.

Test Procedure

1. Check the calibration of the measuring instrument using either an internal calibrator or a known signal from an external generator.
2. Position the EUT without connection to measurement instrument. Put it on the Rotated table and turn on the EUT and make it operate in transmitting mode. Then set it to Low Channel and High Channel 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, for Radiated emissions restricted band RBW=1MHz, VBW=3MHz.
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 Data

Environmental Conditions

Temperature:	27 °C
Relative Humidity:	56 %
ATM Pressure:	100.9 kPa

The testing was performed by Jim Li on 2008-07-14.

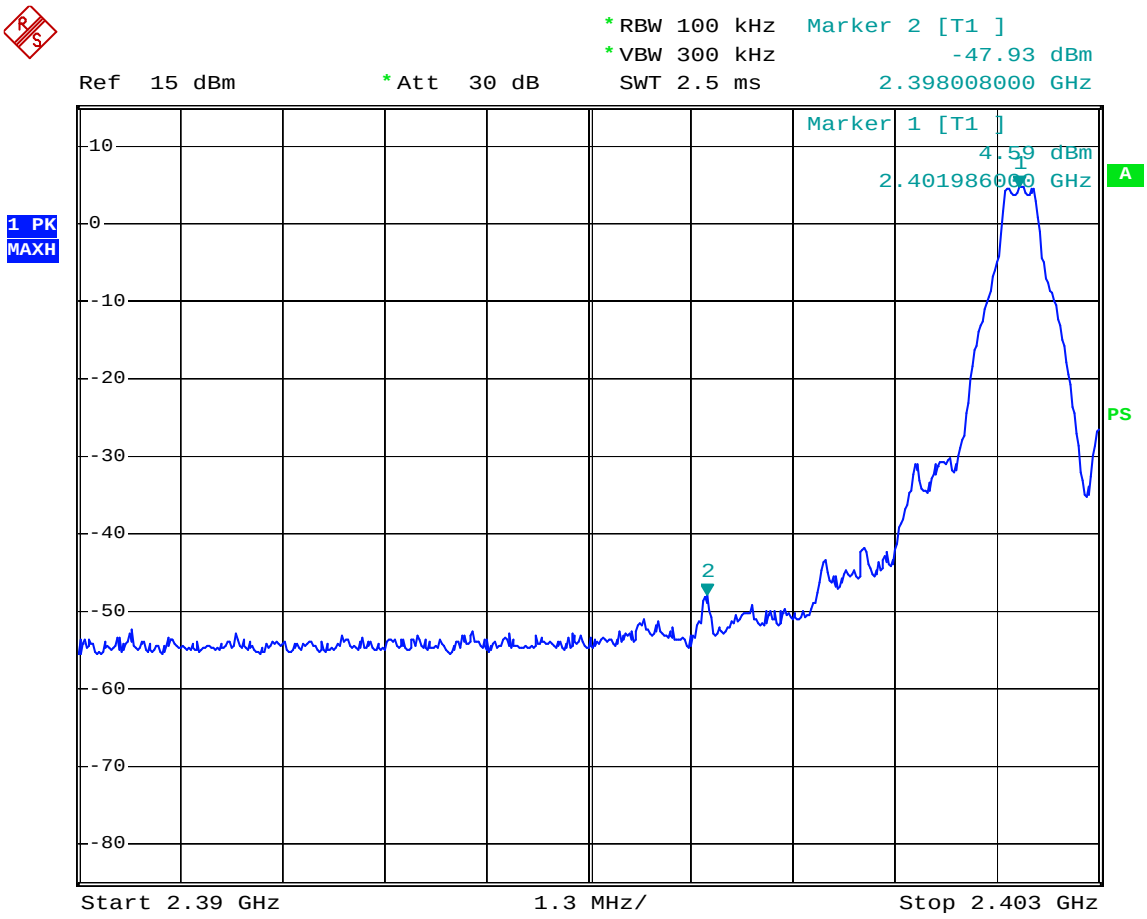
Test Mode: Transmitting

Test Result: Compliant

Please refer to the following table and plots.

Frequency (MHz)	Delta Peak to band emission (dBc)	Limit (dBc)
2398.008	52.52	20
2491.222	56.86	20

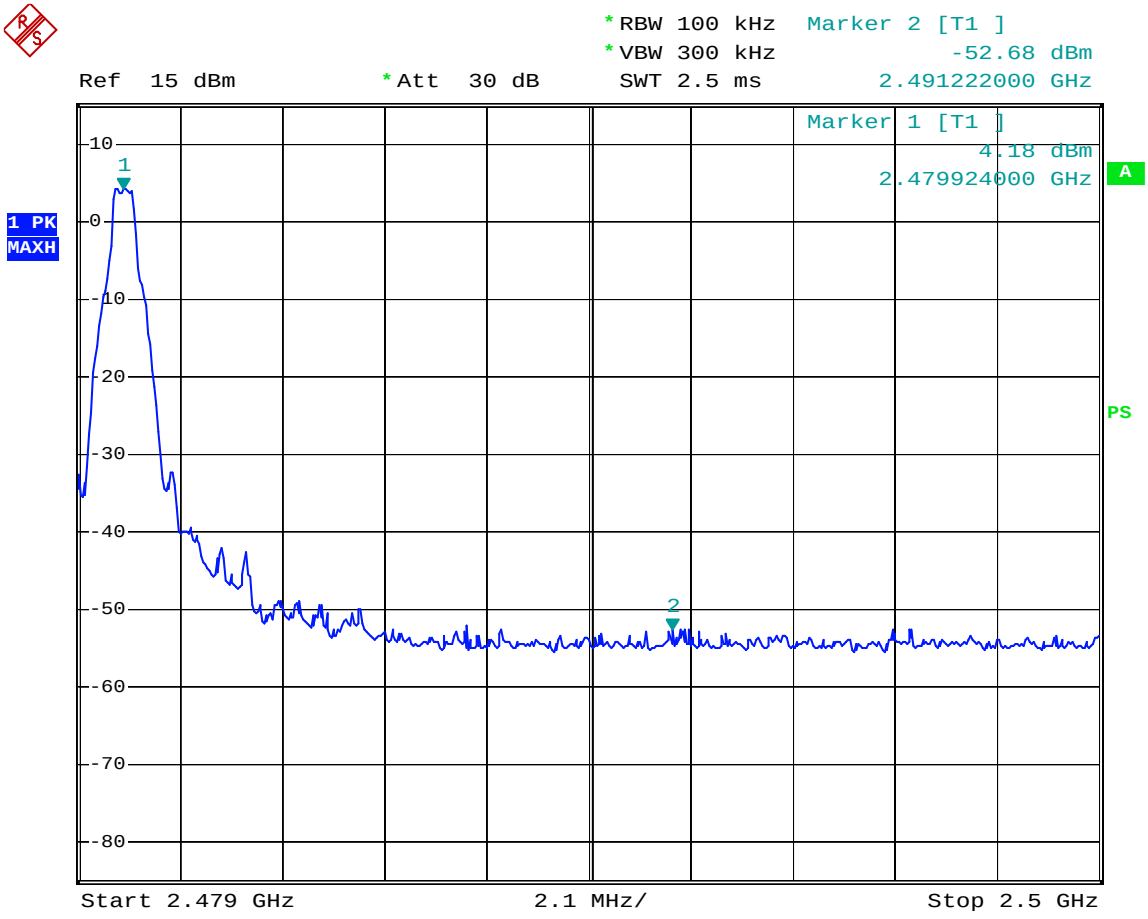
Band Edge Left Side



band edge left

Date: 14.JUL.2008 20:46:04

Band Edge Right Side



band edge right

Date: 14.JUL.2008 20:43:56

******* END OF REPORT *******