

FCC PART 15.249

## MEASUREMENT AND TEST REPORT

For

**HMM Heidelberg-Medical-Marketing GmbH**

Friedrichstr. 89, 69221 Dossenheim, Germany

**FCC ID: YF9H80400**

<b>Report Type:</b> Original Report	<b>Product Type:</b> hFon Smart Phone
<b>Test Engineer:</b> <u>Alvin Huang</u> <i>Alvin Huang</i>	
<b>Report Number:</b> <u>RSZ10052102-15.249</u>	
<b>Report Date:</b> <u>2010-10-12</u>	
<b>Reviewed By:</b> <u>Merry Zhao</u> <i>Merry Zhao</i> EMC Engineer	
<b>Prepared By:</b> 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	

**Note:** This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. (Shenzhen). This report **must not** be used by the customer to claim product certification, approval, or endorsement by NVLAP\*, NIST, or any agency of the Federal Government.

\* This report may contain data that are not covered by the NVLAP accreditation and are marked with an asterisk "\*" (Rev.2)

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## GENERAL INFORMATION

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### Product Description for Equipment under Test (EUT)

The *HMM Heidelberg-Medical-Marketing GmbH*'s product, model number: *H80400* (FCC ID: *YF9H80400*) or the "EUT" as referred to in this report is a *hFon smart phone*, which measures approximately: 12.0 cm (L) x 6.0 cm (W) x 1.6 cm (H), rated input voltage: DC 3.7V battery.

#### Frequency Range:

Cellular Band: 824 -849 MHz (Tx), 869-894 MHz (Rx)  
PCS Band: 1850-1910 MHz (Tx), 1930-1990 MHz (Rx)  
Bluetooth: 2400-2483.5 MHz (Tx/Rx)  
Wi-Fi: 2412-2462 MHz (Tx/Rx)  
ANT: 2403-2480 MHz (Tx/Rx)

Modulation Mode: GMSK (PCS/DCS); GFSK (Bluetooth); Wi-Fi (DSSS/OFDM); GFSK (ANT)

#### Transmitter Output Power:

Cellular Band: 33 dBm, PCS Band: 30 dBm  
Bluetooth: < 4 dBm, 802.11b/g Wi-Fi: ≤10 dBm  
2.4 GHz Lower Power Transceiver ANT: 0 dBm

*\* All measurement and test data in this report was gathered from production sample serial number: 1005063 (Assigned by BACL, Shenzhen). The EUT was received on 2010-05-21.*

### Objective

This Type approval report is prepared on behalf of *HMM Heidelberg-Medical-Marketing GmbH* in accordance with Part 2, Subpart J, and 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, 15.109, 15.209 and 15.249 rules.

### Related Submittal(s)/Grant(s)

FCC Part 22H & 24E submission with FCC ID: YF9H80400.  
FCC Part 15.247 of Wi-Fi portion submission with FCC ID: YF9H80400.  
FCC Part 15.247 of Bluetooth portion submission with FCC ID: YF9H80400.

### 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 radiated and conducted emissions measurement was performed at 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 21, 2007. 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).



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

## SYSTEM TEST CONFIGURATION

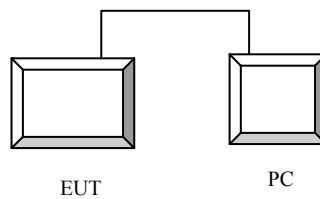
### Justification

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

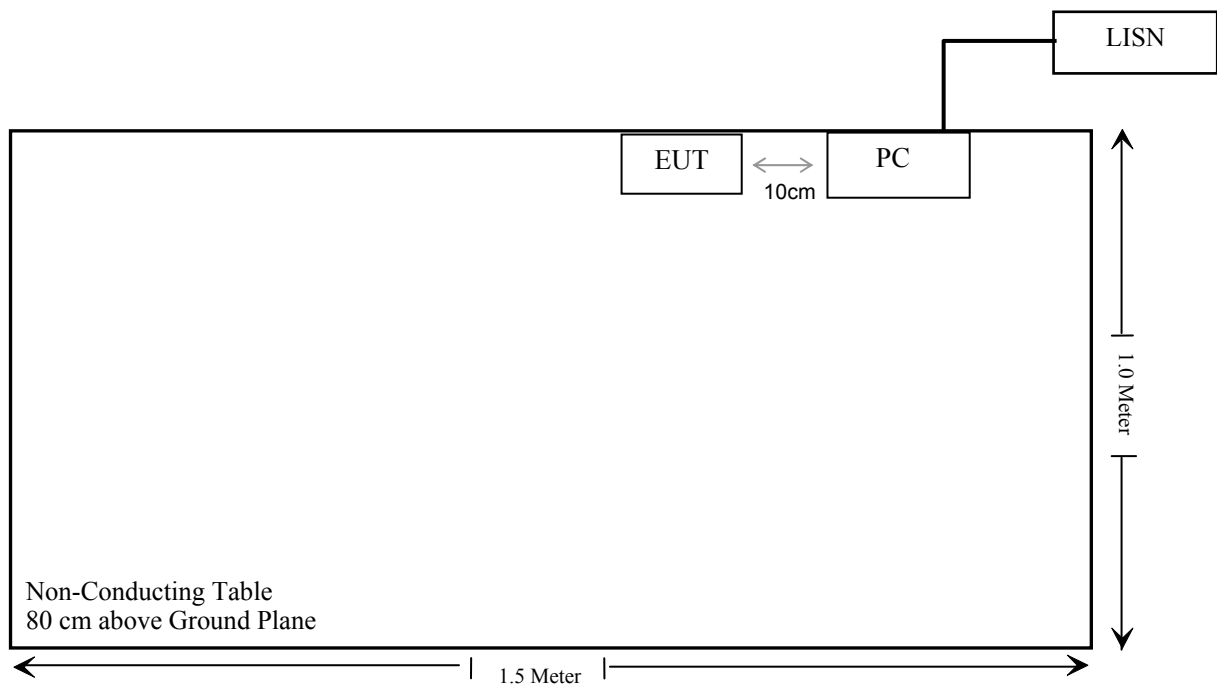
### Equipment Modifications

No modifications were made to the unit tested.

### Configuration of Test Setup



### Block Diagram of Test Setup



## SUMMARY OF TEST RESULTS

FCC Rules	Description of Test	Result
§15.203	Antenna Requirement	Compliance
§15.207(a)	Conduction Emissions	Compliance
§15.205(a), §15.209(a), 15.249(a), §15.249(c)	Radiated Emissions	Compliance
§15.249(d)	Out of Band Emissions	Compliance
§15.215(c)	20 dB Bandwidth	Compliance

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**FCC §15.203 - ANTENNA REQUIREMENT**

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**Applicable Standard**

For intentional device, 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.

**Antenna Connector Construction**

The EUT has a ANT (SMD) antenna on PCB, the gain is 0 dBi, which are in accordance to section 15.203, please refer to the internal photos.

**Result:** Compliant.

Please refer to the EUT photos.



## FCC §15.207 (a) - CONDUCTED EMISSIONS

### Applicable Standard

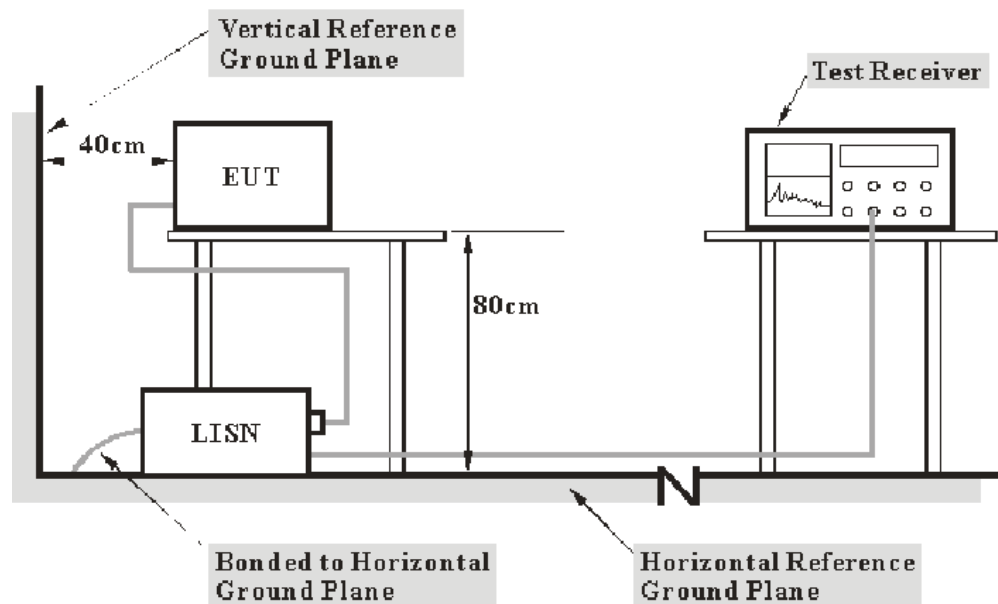
FCC §15.207

### 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  $\pm 2.4$  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 15.207 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 PC 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:

<u>Frequency Range</u>	<u>IF B/W</u>
150 kHz – 30 MHz	9 kHz

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCS30	830245/006	2010-03-03	2011-03-02
Rohde & Schwarz	L.I.S.N.	ESH2-Z5	892107/021	2010-03-09	2011-03-08

\* **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 PC was connected to 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:

**11.00 dB at 0.525 MHz in the Neutral conductor mode**

## Test Data

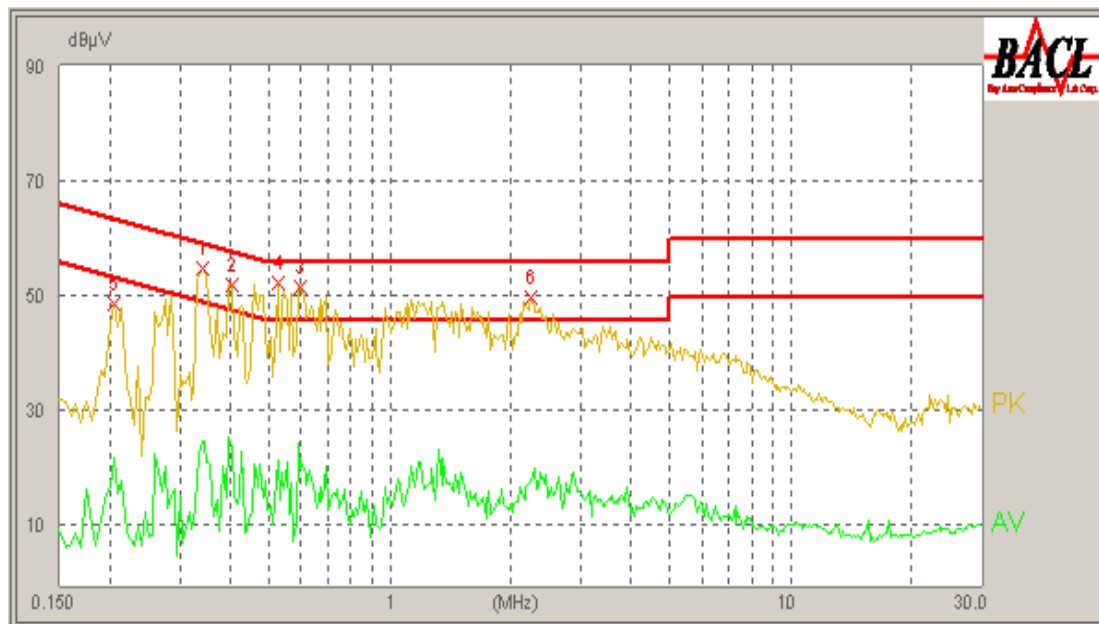
### Environmental Conditions

<b>Temperature:</b>	25 ° C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.0 kPa

*The testing was performed by Alvin Huang on 2010-09-18.*

Test Mode: Transmitting & Charging

120 V, 60 Hz, Line:



Conducted Emissions			FCC Part 15.249		
Frequency (MHz)	Corrected Factor (dB)	Cord. Result (dBμV)	Limit (dBμV)	Margin (dB)	Remark (PK/QP/Ave)
0.525	10.20	42.90	56.00	13.10	QP
0.405	10.00	44.71	58.71	14.00	QP
0.340	10.00	45.99	60.57	14.58	QP
2.250	10.20	41.40	56.00	14.60	QP
0.595	10.20	39.72	56.00	16.28	QP
0.205	10.10	43.68	64.43	20.75	QP
0.525	10.20	21.84	46.00	24.16	Ave
0.405	10.00	24.37	48.71	24.34	Ave
0.340	10.00	25.19	50.57	25.38	Ave
0.595	10.20	20.21	46.00	25.79	Ave
2.250	10.20	18.01	46.00	27.99	Ave
0.205	10.10	22.24	54.43	32.19	Ave

**120V, 60 Hz, Neutral:**

Conducted Emissions			FCC Part 15.249		
Frequency (MHz)	Corrected Factor (dB)	Cord. Result (dBμV)	Limit (dBμV)	Margin (dB)	Remark (PK/QP/Ave)
0.525	10.20	45.00	56.00	11.00	QP
0.345	10.00	48.00	60.43	12.43	QP
0.400	10.00	44.62	58.86	14.24	QP
2.365	10.20	36.76	56.00	19.24	QP
0.210	10.10	42.84	64.29	21.45	QP
0.280	10.10	40.00	62.29	22.29	QP
0.525	10.20	22.36	46.00	23.64	Ave
0.345	10.00	26.44	50.43	23.99	Ave
2.360	10.20	19.20	46.00	26.80	Ave
0.400	10.00	21.20	48.86	27.66	Ave
0.210	10.10	21.61	54.29	32.68	Ave
0.280	10.10	17.29	52.29	35.00	Ave

## FCC §15.205, §15.209 & §15.249 - RADIATED EMISSIONS

### Applicable Standard

As per FCC §15.249 (a), except as provided in paragraph (b) of this section, the field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:

Fundamental frequency	Field strength of fundamental (millivolts/meter)	Field strength of harmonics (microvolts/meter)
902–928 MHz	50	500
2400–2483.5 MHz	50	500
5725–5875 MHz	50	500
24.0–24.25 GHz	250	2500

As per FCC §15.249 (c), Field strength limits are specified at a distance of 3 meters.

### 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  $\pm 4.0$  dB.

### Test Equipment Setup

The spectrum analyzer or receiver is set as:

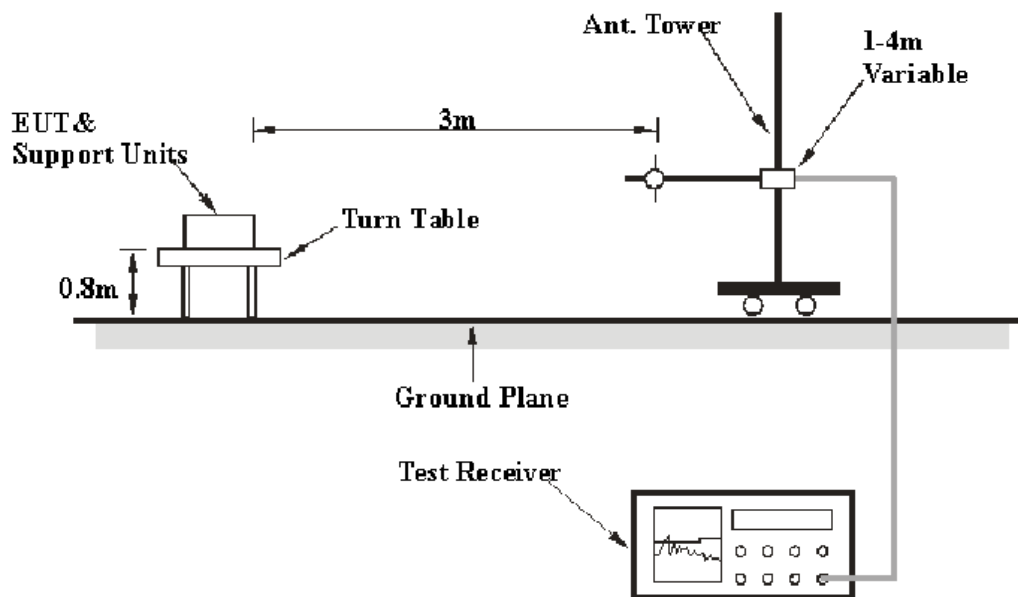
Below 1000 MHz:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto  
Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

## EUT Setup



The radiated emission and out of band emission tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC §15.209 and §15.249 limits.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
HP	Amplifier	HP8447D	2944A09795	2010-08-02	2011-08-02
Rohde & Schwarz	EMI Test Receiver	ESCI	100035	2009-11-24	2010-11-23
Sunol Sciences	Broadband Antenna	JB1	A040904-1	2010-03-11	2011-03-11
HP	Amplifier	8449B	3008A00277	2009-09-12	2010-09-11
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04
Rohde & Schwarz	Spectrum Analyzer	FSEM30	849720/019	2010-07-08	2011-07-08

\* **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 and other support equipment were connected to the AC floor outlet.

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

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of horizontal and vertical.

## 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:

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

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

$$\text{Margin} = \text{Limit} - \text{Corrected Amplitude}$$

## Test Results Summary

According to the data in the following table, the EUT complied with the FCC Part 15.209 and 15.249, with the worst margin reading of:

### Below 1 GHz:

**7.2 dB at 756.205000 MHz in the Vertical polarization**

### Above 1 GHz:

**2.94 dB at 4806 MHz in the Vertical polarization, Low Channel**  
**4.06 dB at 4878 MHz in the Vertical polarization, Middle channel**  
**4.23 dB at 4952MHz in the Horizontal polarization, High channel**

## Test Data

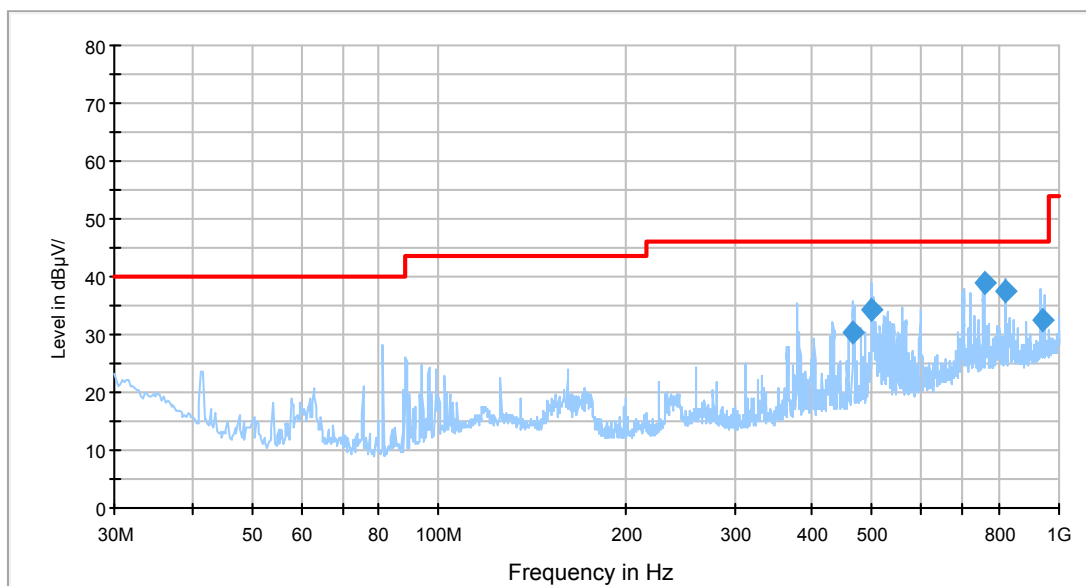
### Environmental Conditions

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

The testing was performed by Alvin Huang on 2010-09-18.

Test Mode: Transmitting

### Below 1 GHz:



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Position (deg)	Correction Factor (dB)	Limit (dBμV/m)	Margin (dB)
756.205000	38.8	123.0	V	175.0	-2.4	46.0	7.2
819.104500	37.7	103.0	V	163.0	-1.6	46.0	8.3
497.026250	34.3	103.0	V	176.0	-8.4	46.0	11.7
465.438750	30.4	125.0	V	183.0	-8.9	46.0	15.6
465.438750	30.4	125.0	V	183.0	-8.9	46.0	15.6
937.027250	32.4	358.0	H	26.0	0.3	46.0	23.6



**Above 1 GHz:**

Indicated		Detector (PK/AV)	Table Angle Degree	Test Antenna		Correction Factor			FCC 15.249/209			
Frequency (MHz)	S.A. Reading (dBμV)			Height (m)	Polar (H/V)	Ant. Factor (dB/m)	Cable Loss (dB)	Pre- Amp. (dB)	Cord. Amp. (dBμV/m)	Limit (dBμV/m)	Margin (dB)	Comment
Low Channel												
4806	38.75	AV	190	1.85	V	34.7	4.36	26.75	51.06	54	2.94*	harmonic
4806	36.45	AV	144	1.92	H	34.6	4.36	26.75	48.66	54	5.34	harmonic
2403	76.13	AV	205	1.25	V	31	3.1	26.8	83.43	94	10.57	Fund.
2403	74.53	AV	185	1.3	H	30.6	3.1	26.8	81.43	94	12.57	Fund.
4806	44.62	PK	190	1.85	V	34.7	4.36	26.75	56.93	74	17.07	harmonic
4806	41.36	PK	144	1.92	H	34.6	4.36	26.75	53.57	74	20.43	harmonic
2403	84.41	PK	205	1.25	V	31	3.1	26.8	91.71	114	22.29	Fund.
2403	81.71	PK	185	1.3	H	30.6	3.1	26.8	88.61	114	25.39	Fund.
Middle Channel												
4882	37.63	AV	324	1.67	V	34.7	4.36	26.75	49.94	54	4.06	harmonic
4882	37.12	AV	165	1.96	H	34.6	4.36	26.75	49.33	54	4.67	harmonic
2441	75.86	AV	176	1.6	V	31	3.1	26.8	83.16	94	10.84	Fund.
2441	73.79	AV	179	1.34	H	30.6	3.1	26.8	80.69	94	13.31	Fund.
4882	43.45	PK	324	1.67	V	34.7	4.36	26.75	55.76	74	18.24	harmonic
4882	42.65	PK	165	1.96	H	34.6	4.36	26.75	54.86	74	19.14	harmonic
2441	84.01	PK	176	1.6	V	31	3.1	26.8	91.31	114	22.69	Fund.
2441	80.81	PK	179	1.34	H	30.6	3.1	26.8	87.71	114	26.29	Fund.
High Channel												
4960	37.46	AV	135	1.76	H	34.7	4.36	26.75	49.77	54	4.23	harmonic
4960	36.85	AV	189	1.35	V	34.6	4.36	26.75	49.06	54	4.94	harmonic
2480	75.13	AV	176	1.65	V	31	3.1	26.8	82.43	94	11.57	Fund.
2480	73.46	AV	256	1.98	H	30.6	3.1	26.8	80.36	94	13.64	Fund.
4960	43.27	PK	189	1.35	V	34.7	4.36	26.75	55.58	74	18.42	harmonic
4960	41.42	PK	135	1.76	H	34.6	4.36	26.75	53.63	74	20.37	harmonic
2480	83.81	PK	176	1.65	V	31	3.1	26.8	91.11	114	22.89	Fund.
2480	80.41	PK	256	1.98	H	30.6	3.1	26.8	87.31	114	26.69	Fund.

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## FCC §15.249(d) – OUT OF BAND EMISSIONS

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### Applicable Standard

Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.

### Test Procedure

The EUT is set 3 meter away from the testing antenna, which is varied from 1-4 mete, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission at the band edge. The receiving antenna should be changed the polarization both of horizontal and vertical.

$$\text{Corrected Amplitude} = \text{Meter Reading} + \text{Antenna Factor} + \text{Cable Loss} - \text{Amplifier Gain}$$

### 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  $\pm 4.0$  dB.

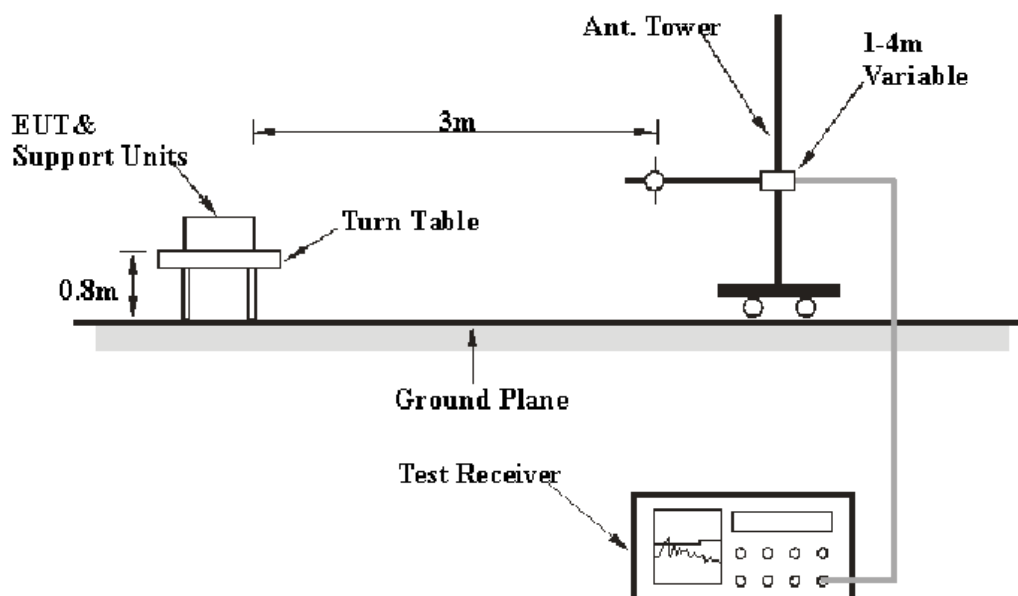
### Test Equipment Setup

The spectrum analyzer or receiver is set as:

Above 1000 MHz:

Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto  
Average: RBW = 1MHz / VBW = 10Hz / Sweep = Auto

## EUT Setup



The radiated emission and out of band emission tests were performed in the 3 meters chamber B, using the setup accordance with the ANSI C63.4-2003. The specification used was the FCC §15.209 and §15.249 limits.

## Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-11-24	2010-11-23
HP	Amplifier	8447E	1937A01046	2010-08-02	2011-08-01
Sunol Sciences	Horn Antenna	DRH-118	A052604	2010-05-05	2011-05-04

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

**Test Data****Environmental Conditions**

<b>Temperature:</b>	25 °C
<b>Relative Humidity:</b>	56 %
<b>ATM Pressure:</b>	100.2 kPa

*\*The testing was performed by Alvin Huang on 2010-03-16.*

**Test Result:** Compliant

Please refer to the following table.

*Test Mode: Transmitting*

Frequency (MHz)	S.A. Reading (dBμV)	Detector PK/AV	Table Direction Degree	Test Antenna			Cable Loss (dB)	Pre-Amp. Gain (dB)	Cord. Amp. (dBμV/m)	FCC 15.249/209	
				Height (m)	Polar (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)
Frequency In Low Channel											
2398.8	45.42	PK	0	1.2	H	33.9	3.03	26.83	55.52	74	18.48
2398.8	33.06	AV	0	1.2	H	33.9	3.03	26.83	43.16	54	10.84
2398.8	44.11	PK	0	15	V	33.9	3.03	26.83	54.21	74	19.79
2398.8	33.53	AV	0	1.5	V	33.9	3.03	26.83	43.63	54	10.37
Frequency In High Channel											
2483.95	45.75	PK	135	1.5	H	33.9	3.18	26.85	55.98	74	18.02
2483.95	34.43	AV	135	1.5	H	33.9	3.18	26.85	44.66	54	9.34
2483.95	47.46	PK	170	1.2	V	33.9	3.18	26.85	57.69	74	16.31
2483.95	35.11	AV	170	1.2	V	33.9	3.18	26.85	45.34	54	8.66

## FCC §15.215(c) – 20 dB BANDWIDTH

### Applicable Standard

Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in Subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated.

### Test Equipment List and Details

Manufacturer	Description	Model	Serial Number	Calibration Date	Calibration Due Date
Rohde & Schwarz	EMI Test Receiver	ESCI	100224	2009-11-24	2010-11-23

\* **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 indicated 20dB bandwidth.
4. Repeat above procedures until all frequencies measured were complete.

### Test Data

#### Environmental Conditions

Temperature:	25 °C
Relative Humidity:	56 %
ATM Pressure:	100.2 kPa

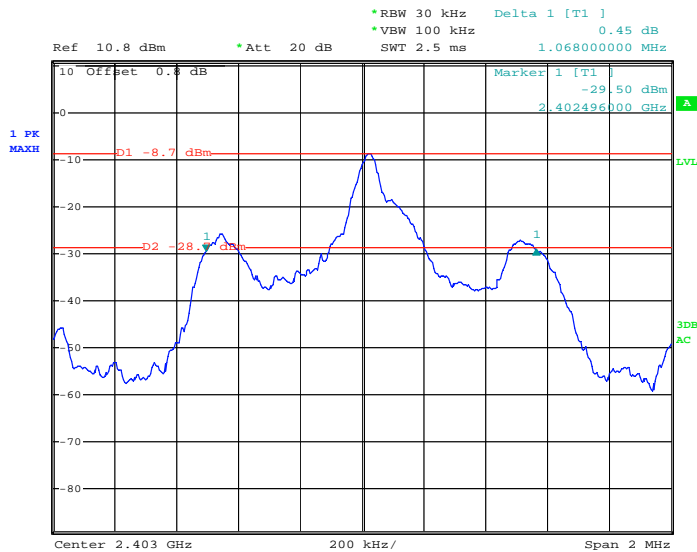
\*The testing was performed by Alvin Huang on 2010-10-08

Test Mode: Transmitting

Pleas refer to the plot and tabular data sheet attached.

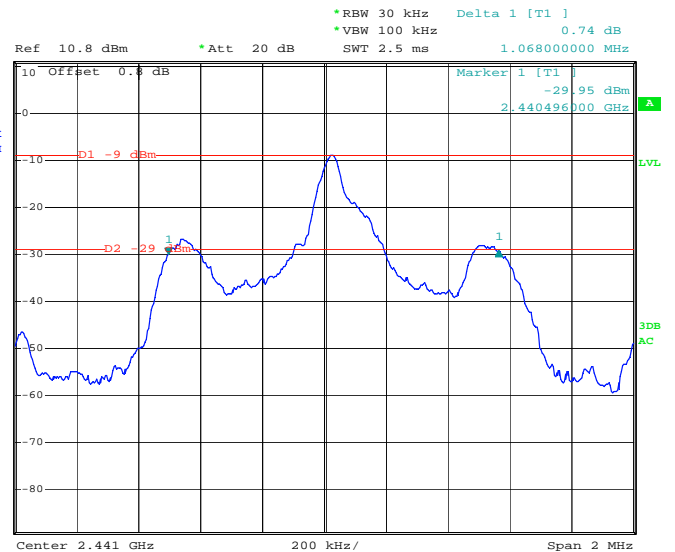
Channel Frequency (MHz)	20 dB Bandwidth (kHz)
2403	1068
2441	1068
2480	1060

## Low Channel



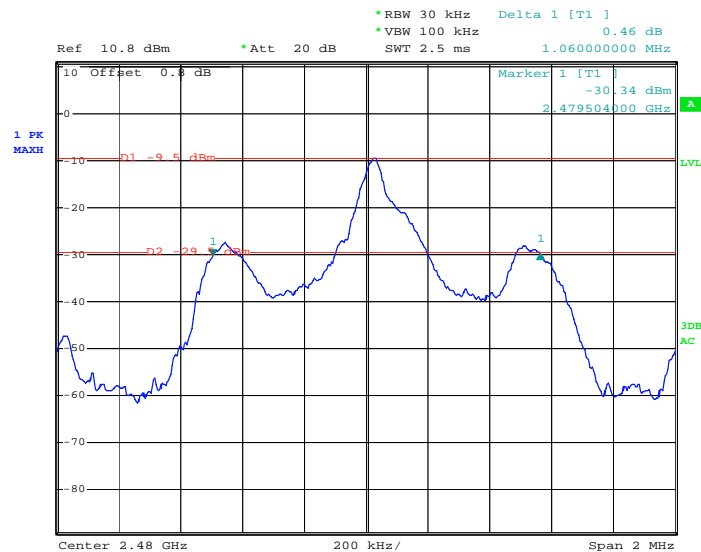
Date: 8.OCT.2010 11:41:29

## Middle Channel



Date: 8.OCT.2010 11:40:27

## High Channel



Date: 8.OCT.2010 11:43:56

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