

# FCC Test Report

APPLICANT : Motorola Mobility, Inc.  
EQUIPMENT : Mobile Phone  
BRAND NAME : MOTOROLA  
MODEL NAME : EX225  
GPPD NUMBER : 3129  
FCC ID : IHDT56MK5  
STANDARD : FCC 47 CFR FCC Part 15 Subpart B  
CLASSIFICATION : Certification

The product was received on Aug. 26, 2011 and completely tested on Sep. 09, 2011. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the procedures given in ANSI C63.4-2003 and shown the compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:



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Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

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SPORTON INTERNATIONAL INC.

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FCC ID : IHDT56MK5

Page Number : 1 of 22

Report Issued Date : Oct. 24, 2011

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### SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	7.2.2	AC Conducted Emission	< 15.107 limits < RSS-Gen table 2 limits	PASS	Under limit 13.3 dB at 0.19 MHz
3.2	15.109	7.2.3.2	Radiated Emission	< 15.109 limits or < RSS-Gen table 1 limits (Section 6)	PASS	Under limit 9.50 dB at 50.25 MHz

# 1. General Description

## 1.1. Applicant

Motorola Mobility, Inc.

No. 1, Wang Jing East Road, Chao Yang District, 100102 Beijing, P. R. China

## 1.2. Manufacturer

Arima Communications Corp.

6F., No. 866, Jhongjheng Rd., Jhonghe Dist., New Taipei City 23586, Taiwan

## 1.3. Feature of Equipment Under Test

Product Feature & Specification	
Equipment	Mobile Phone
Brand Name	MOTOROLA
Model Name	EX225
FCC ID	IHDT56MK5
Tx Frequency Range	GSM850 : 824 MHz ~ 849 MHz GSM1900 : 1850 MHz ~ 1910 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz WLAN : 2400 MHz ~ 2483.5 MHz
Rx Frequency Range	GSM850 : 869 MHz ~ 894 MHz GSM1900 : 1930 MHz ~ 1990 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz WLAN : 2400 MHz ~ 2483.5 MHz
Antenna Type	WWAN : Fixed Internal Antenna WLAN / Bluetooth : IFA Antenna
HW Version	P2
SW Version	BREA3G_W_07.09.00R_S_WIFI
Type of Modulation	GSM / GPRS : GMSK EDGE : 8PSK Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : $\pi/4$ -DQPSK Bluetooth EDR (3Mbps) : 8-DPSK 802.11b : DSSS (BPSK / QPSK / CCK) 802.11g : OFDM (BPSK / QPSK / 16QAM / 64QAM)
EUT Stage	Identical Prototype

**Remark:** The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.

## 1.4. Test Site

<b>Test Site</b>	SPORTON INTERNATIONAL INC.		
<b>Test Site Location</b>	No. 52, Hwa Ya 1 <sup>st</sup> Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL: +886-3-327-3456 FAX: +886-3-328-4978		
<b>Test Site No.</b>	<b>Sporton Site No.</b>		<b>FCC/IC Registration No.</b>
	CO05-HY	03CH07-HY	722060/4086B-1

## 1.5. Applied Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- FCC 47 CFR FCC Part 15 Subpart B
- ANSI C63.4-2003
- IC RSS-Gen Issue 3

**Remark:** All test items were verified and recorded according to the standards and without any deviation during the test.

## 1.6. Ancillary Equipment List

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	System Simulator	R&S	CMU 200	N/A	N/A	Unshielded, 1.8 m
2.	WLAN AP	D-Link	DIR-628	KA2DIR628A2	N/A	Unshielded, 1.8 m
3.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
4.	Notebook	DELL	P20G	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
5.	Notebook	DELL	Inspiron N4110	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
6.	LCD Monitor	Lenovo	6135-AB1	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
7.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A

## 2. Test Configuration of Equipment Under Test

### 2.1. Test Mode

The EUT has been associated with peripherals pursuant to ANSI C63.4-2003 and configuration operated in a manner tended to maximize its emission characteristics in a typical application.

Frequency range investigated: conduction (150 kHz to 30 MHz), radiation (30MHz to the 5th harmonic of the highest fundamental frequency or to 40 GHz, whichever is lower).

The following tables are showing the test modes as the worst cases and recorded in this report.

Item	EUT Configuration	Test Condition		
		EMI AC	EMI RE<1G	EMI RE≥1G
1.	Charging Mode (EUT with adapter)	☒	☒	Note 1
2.	Data application transferred mode (EUT with notebook)	☒	☒	☒

**Abbreviations:**

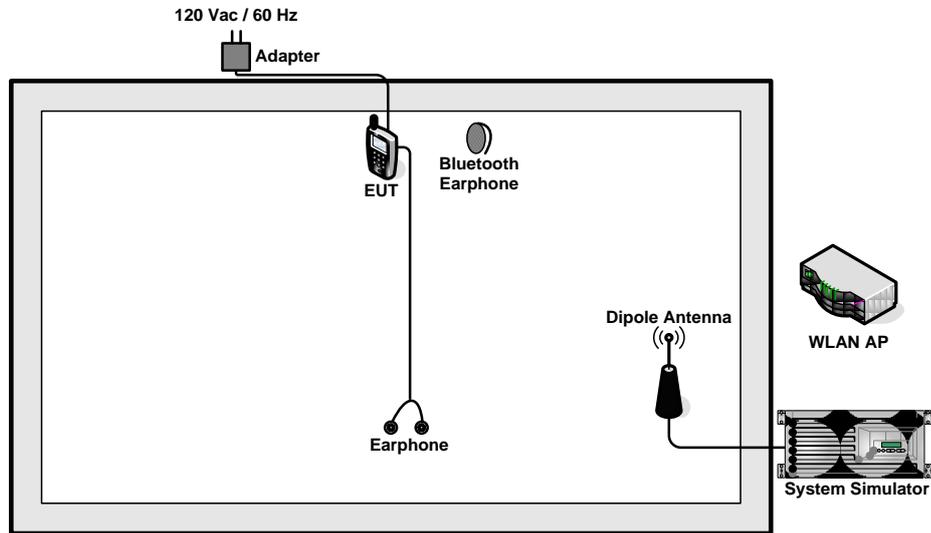
- EMI AC: AC conducted emissions
- EMI RE ≥ 1G: EUT radiated emissions ≥ 1GHz
- EMI RE < 1G: EUT radiated emissions < 1GHz

**Note 1:** Testing for this mode is not required or not the worst case.

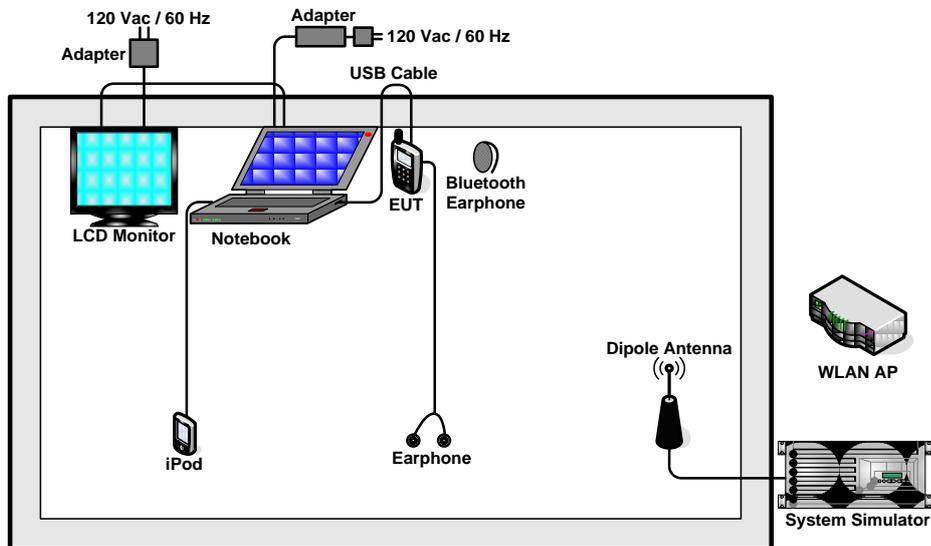
Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1/2	Mode 1: GSM850 Idle + Bluetooth Idle + WLAN Idle + Adapter + Earphone + Camera Mode 2: GSM1900 Idle + Bluetooth Idle + WLAN Idle + Adapter + Earphone + MPEG4 Mode 3: GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)
Radiated Emissions < 1GHz	1/2	Mode 1: GSM850 Idle + Bluetooth Idle + WLAN Idle + Adapter + Earphone + Camera Mode 2: GSM1900 Idle + Bluetooth Idle + WLAN Idle + Adapter + Earphone + MPEG4 Mode 3: GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)
Radiated Emissions ≥ 1GHz	2	Mode 1: GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)
<p><b>Remark:</b></p> <ol style="list-style-type: none"> <li>1. The worst case of AC is mode 3; only the test data of this mode was reported.</li> <li>2. The worst case of RE &lt; 1G is mode 3; only the test data of this mode was reported.</li> <li>3. Link with Notebook means data application transferred mode between DUT and Notebook.</li> </ol>		

## 2.2. Connection Diagram of Test System

### <EUT with Adapter Mode>



### <EUT with USB Cable (Link with Notebook) Mode>





## **2.3. Test Software**

The EUT was in GSM idle mode during the testing. The EUT was synchronized to the BCCH, and is in continuous receiving mode by setting system simulator's paging reorganization.

At the same time, the EUT was attached to the Bluetooth earphone or WLAN AP, and the following programs installed in the EUT were programmed during the test.

1. Execute the program, "Winthrax", installed in notebook for active sync files transfer with EUT via USB cable.
2. Execute "Video Player" to play MPEG4 files.
3. Turn on camera to capture images.

### 3. Test Result

#### 3.1. Test of AC Conducted Emission Measurement

##### 3.1.1 Limits of AC Conducted Emission

For equipment that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table.

Frequency of emission (MHz)	Conducted limit (dBuV)	
	Quasi-peak	Average
0.15-0.5	66 to 56*	56 to 46*
0.5-5	56	46
5-30	60	50

\*Decreases with the logarithm of the frequency.

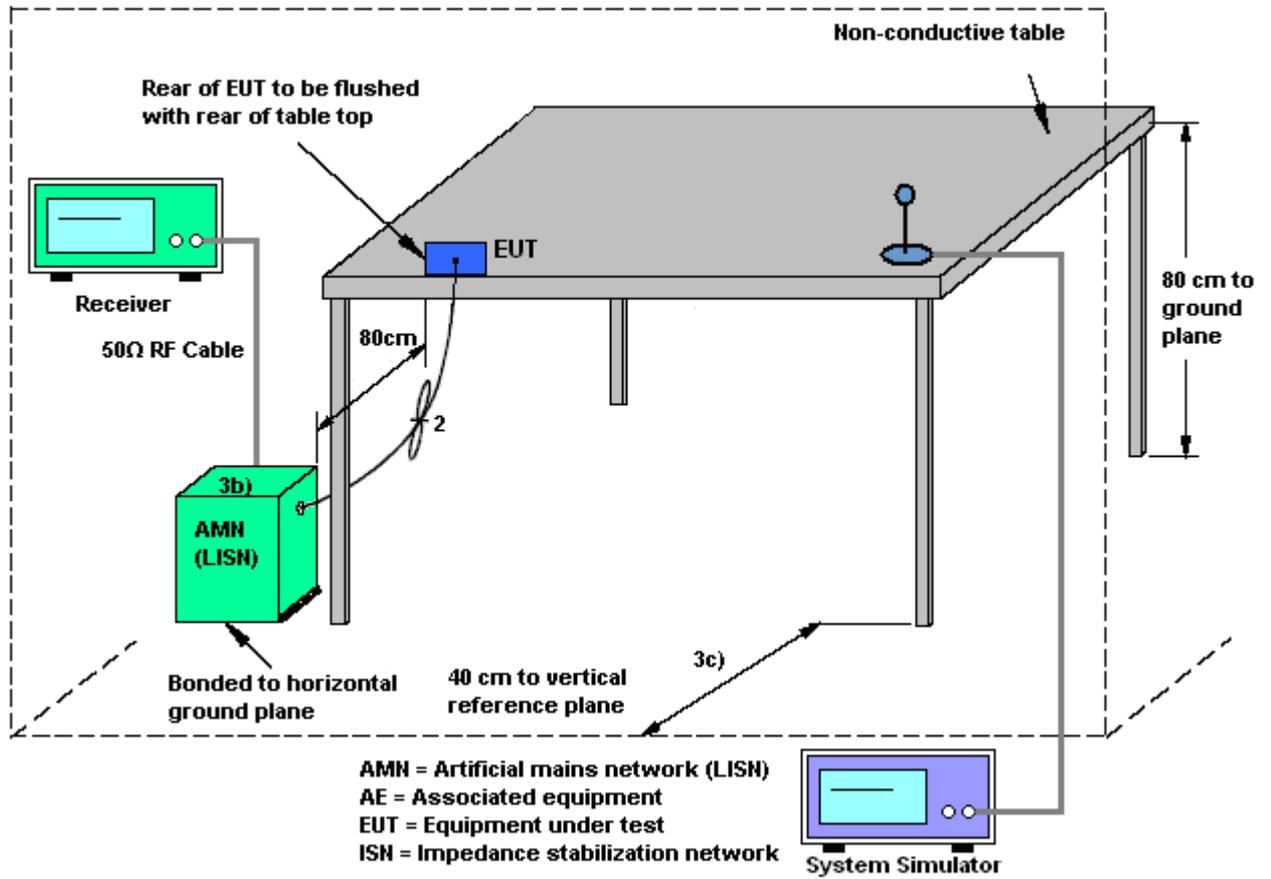
##### 3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

##### 3.1.3 Test Procedure

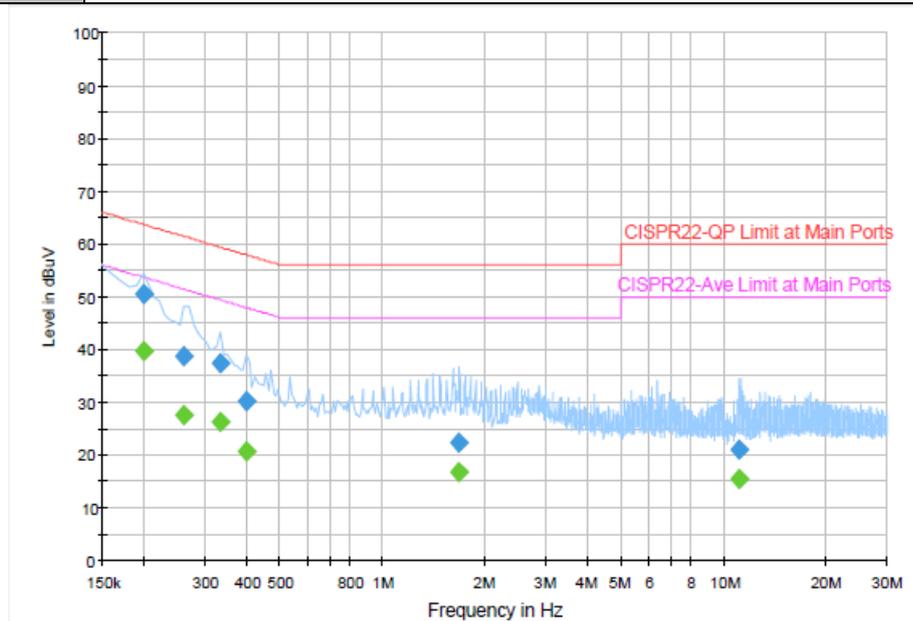
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
4. The LISN provides 50 ohm coupling impedance for the measuring instrument.
5. The FCC states that a 50 ohm, 50 microhenry LISN should be used.
6. Both sides of AC line were checked for maximum conducted interference.
7. The frequency range from 150 kHz to 30 MHz was searched.
8. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.

### 3.1.4 Test Setup



### 3.1.5 Test Result of AC Conducted Emission

Test Mode :	Mode 3	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



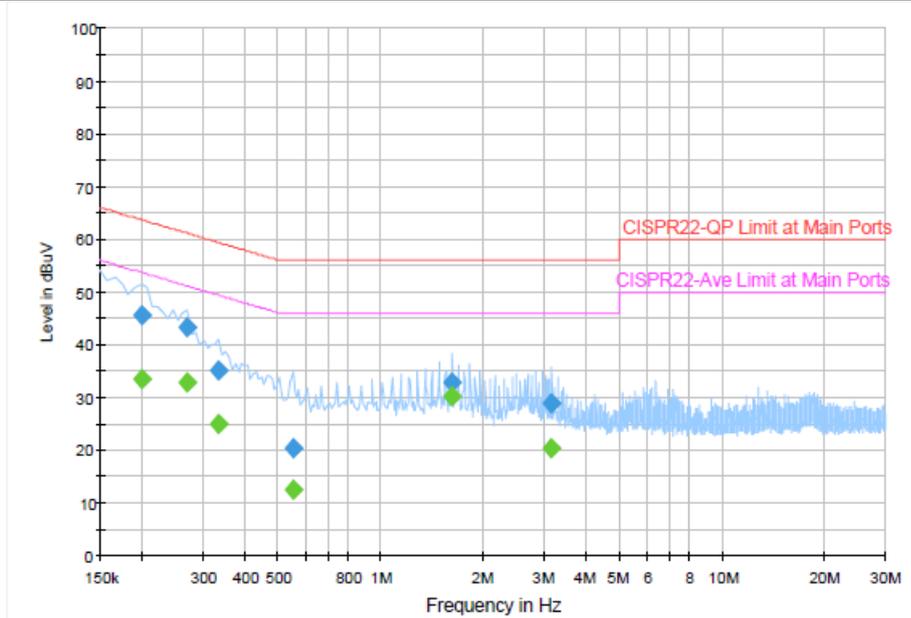
#### Final Result 1

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	50.4	Off	L1	19.4	13.3	63.7
0.262000	38.7	Off	L1	19.4	22.7	61.4
0.334000	37.4	Off	L1	19.4	22.0	59.4
0.398000	30.2	Off	L1	19.4	27.7	57.9
1.670000	22.4	Off	L1	19.4	33.6	56.0
11.038000	21.1	Off	L1	19.6	38.9	60.0

#### Final Result 2

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	39.5	Off	L1	19.4	14.2	53.7
0.262000	27.7	Off	L1	19.4	23.7	51.4
0.334000	26.2	Off	L1	19.4	23.2	49.4
0.398000	20.7	Off	L1	19.4	27.2	47.9
1.670000	16.8	Off	L1	19.4	29.2	46.0
11.038000	15.6	Off	L1	19.6	34.4	50.0

Test Mode :	Mode 3	Temperature :	20~22°C
Test Engineer :	Novic Chiang	Relative Humidity :	42~44%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



**Final Result 1**

Frequency (MHz)	QuasiPeak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	45.6	Off	N	19.4	18.1	63.7
0.270000	43.2	Off	N	19.4	17.9	61.1
0.334000	35.0	Off	N	19.4	24.4	59.4
0.550000	20.3	Off	N	19.4	35.7	56.0
1.614000	32.8	Off	N	19.5	23.2	56.0
3.158000	28.8	Off	N	19.5	27.2	56.0

**Final Result 2**

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.198000	33.6	Off	N	19.4	20.1	53.7
0.270000	32.8	Off	N	19.4	18.3	51.1
0.334000	24.8	Off	N	19.4	24.6	49.4
0.550000	12.6	Off	N	19.4	33.4	46.0
1.614000	30.2	Off	N	19.5	15.8	46.0
3.158000	20.4	Off	N	19.5	25.6	46.0



### 3.2. Test of Radiated Emission Measurement

#### 3.2.1. Limit of Radiated Emission

The emissions from an intentional radiator shall not exceed the field strength levels specified in the following table:

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
0.009 – 0.490	2400/F(kHz)	300
0.490 – 1.705	24000/F(kHz)	30
1.705 – 30.0	30	30
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

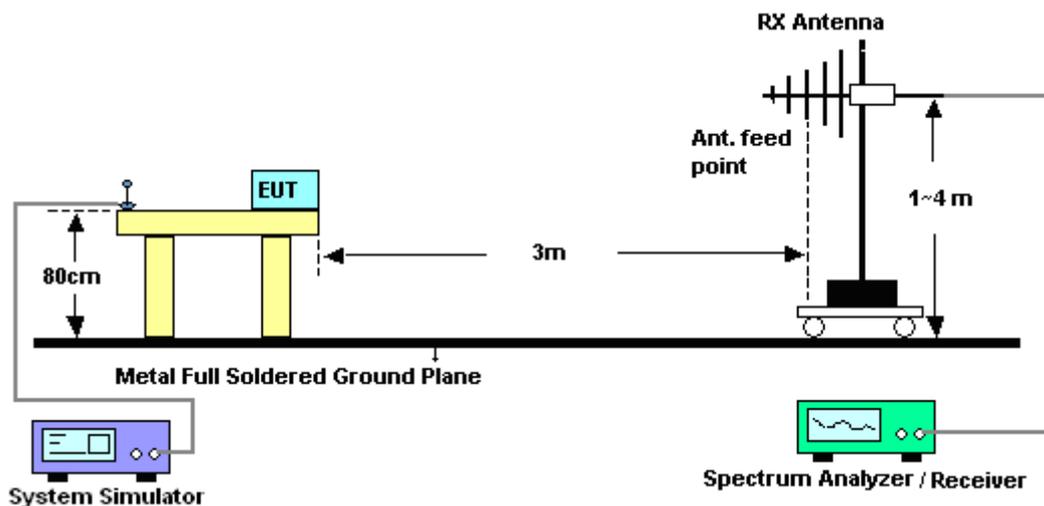
#### 3.2.2. Measuring Instruments

See list of measuring instruments of this test report.

### 3.2.3. Test Procedures

1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one meter and four meters above ground to find the maximum value of the field strength for both horizontal polarization and vertical polarization of the antenna.
5. For each suspected emission, the EUT was arranged to its worst case and then tune the antenna tower (from 1 m to 4 m) and turntable (from 0 degree to 360 degrees) to find the maximum reading.
6. Set the test-receiver system to Peak Detect Function and specified bandwidth with Maximum Hold Mode.
7. If the emission level of the EUT in peak mode was 3 dB lower than the limit specified, then testing will be stopped and peak values of EUT will be reported, otherwise, the emissions will be repeated one by one using the quasi-peak method and reported
8. Emission level (dBuV/m) = 20 log Emission level (uV/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

### 3.2.4. Test Setup of Radiated Emission





3.1.6 Test Results of Radiated Emissions (9 kHz ~ 30 MHz)

Frequency (MHz)	Level (dBuV)	Over Limit (dB)	Limit Line (dBuV)	Remark
-	-	-	-	See Note

Note:

The amplitude of spurious emissions that are attenuated by more than 20dB below the permissible value has no need to be reported.

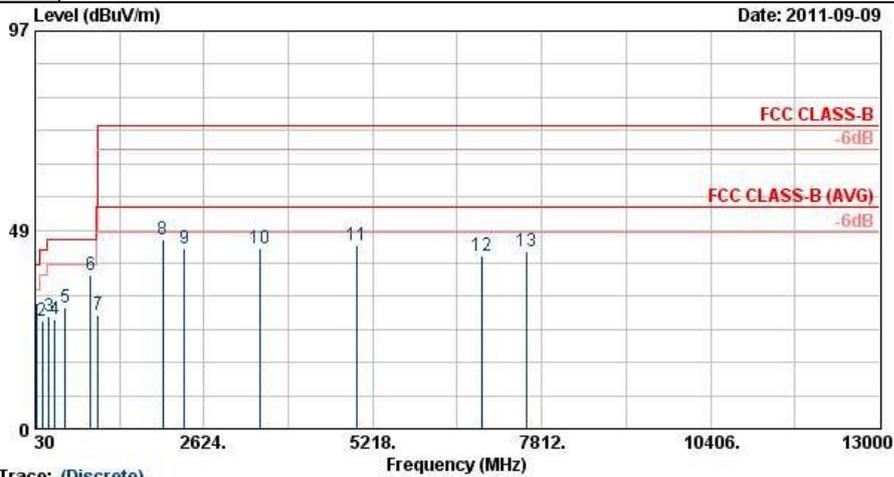
Distance extrapolation factor =  $40 \log(\text{specific distance} / \text{test distance})$  (dB);

Limit line = specific limits (dBuV) + distance extrapolation factor.



3.2.5. Test Result of Radiated Emission

Test Mode :	Mode 3	Temperature :	23~25°C
Test Engineer :	Ivan Chiang	Relative Humidity :	49~50%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)		
Remark :	#6 is System Simulator Signal which can be ignored.		

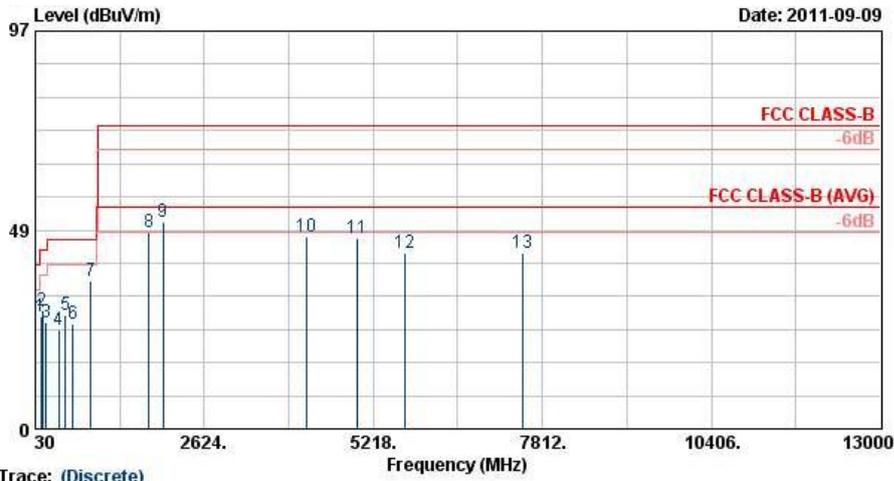


Trace: (Discrete)  
 Site : D3CH07-HY  
 Condition : FCC CLASS-B HF-ANT\_110816 HORIZONTAL  
 Power : From System  
 Mode : Mode 3

	Freq	Level	Over Limit	Limit	ReadAntenna	Cable	Preamp	Ant	Table	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1 @	50.25	30.50	-9.50	40.00	53.06	8.28	0.70	31.54	141	259 Peak
2	136.38	26.30	-17.20	43.50	45.08	11.59	1.19	31.56	---	---
3	240.06	27.45	-18.55	46.00	45.36	11.98	1.53	31.42	---	---
4	330.10	26.57	-19.43	46.00	41.64	14.39	1.85	31.31	---	---
5	497.40	29.64	-16.36	46.00	40.08	18.18	2.44	31.07	---	---
6 @	881.70	37.38			41.36	23.42	3.31	30.71	---	---
7	996.50	27.88	-26.12	54.00	30.12	24.84	3.51	30.58	---	---
8	1996.00	46.30	-27.70	74.00	67.71	31.50	5.43	58.34	100	0 Peak
9	2324.00	44.09	-29.91	74.00	64.59	31.96	5.92	58.37	---	---
10	3492.00	43.92	-30.08	74.00	62.38	32.80	7.81	59.07	---	---
11	4980.00	44.72	-29.28	74.00	60.35	34.10	9.16	58.89	---	---
12	6902.00	42.37	-31.63	74.00	54.70	35.68	9.89	57.91	---	---
13	7580.00	43.17	-30.83	74.00	55.40	35.72	10.25	58.20	---	---



Test Mode :	Mode 3	Temperature :	23~25°C
Test Engineer :	Ivan Chiang	Relative Humidity :	49~50%
Test Distance :	3m	Polarization :	Vertical
Function Type :	GSM 850 Idle + Bluetooth Idle + WLAN Idle + Earphone + USB Cable (Data Link with Notebook)		
Remark :	#7 is System Simulator Signal which can be ignored.		



Trace: (Discrete)  
 Site : 03CH07-HY  
 Condition : FCC CLASS-B HF-ANT\_110816 VERTICAL  
 Power : From System  
 Mode : Mode 3

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Antenna Factor	Cable Loss	Preamp Factor	Ant Pos	Table Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	120.18	27.33	-16.17	43.50	46.26	11.53	1.10	31.56	---	---	Peak
2	136.38	28.90	-14.60	43.50	47.68	11.59	1.19	31.56	114	196	Peak
3	194.70	25.93	-17.57	43.50	47.04	9.09	1.30	31.50	---	---	Peak
4	388.20	24.03	-21.97	46.00	36.93	16.20	2.12	31.21	---	---	Peak
5	497.40	27.78	-18.22	46.00	38.23	18.18	2.44	31.07	---	---	Peak
6	606.60	25.56	-20.44	46.00	33.93	19.84	2.71	30.91	---	---	Peak
7 @	881.70	36.19			40.17	23.42	3.31	30.71	---	---	Peak
8	1774.00	47.82	-26.18	74.00	71.39	29.85	5.05	58.47	---	---	Peak
9	1990.00	50.42	-23.58	74.00	72.00	31.37	5.39	58.35	100	0	Peak
10	4182.00	46.72	-27.28	74.00	63.56	33.66	9.02	59.51	---	---	Peak
11	4982.00	46.40	-27.60	74.00	62.02	34.10	9.16	58.89	---	---	Peak
12	5702.00	42.90	-31.10	74.00	55.63	34.79	9.93	57.45	---	---	Peak
13	7502.00	42.74	-31.26	74.00	55.10	35.70	10.15	58.21	---	---	Peak

## 4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
EMI Test Receive	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Aug. 21, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz – 30MHz	Dec. 03, 2010	Dec. 02, 2011	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz – 30MHz	Dec. 01, 2010	Nov. 30, 2011	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 30, 2010	Oct. 29, 2011	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP30	101067	9KHz ~ 30GHz	Dec. 03, 2010	Dec. 02, 2011	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 10, 2011	Aug. 09, 2012	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Dec. 06, 2010	Dec. 05, 2011	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32dB.GAIN	Mar. 29, 2011	Mar. 28, 2012	Radiation (03CH07-HY)
EMI TEST RECEIVER	R&S	ESCI 7	100724	9kHz~7GHz	Aug. 22, 2011	Aug. 21, 2012	Radiation (03CH07-HY)
Pre Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	159088	1GHz ~ 18GHz	Feb. 21, 2011	Feb. 20, 2012	Radiation (03CH07-HY)
System Simulator	R&S	CMU200	117591	N/A	Oct. 18, 2010	Oct. 17, 2011	-

## 5. Uncertainty of Evaluation

### Uncertainty of Conducted Emission Measurement (150 kHz ~ 30 MHz)

Contribution	Uncertainty of $X_i$		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.10	Normal (k=2)	0.05
Cable Loss	0.10	Normal (k=2)	0.05
AMN Insertion Loss	2.50	Rectangular	0.63
Receiver Specification	1.50	Rectangular	0.43
Site Imperfection	1.39	Rectangular	0.80
Mismatch	+0.34 / -0.35	U-Shape	0.24
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>1.13</b>		
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>2.26</b>		

### Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Contribution	Uncertainty of $X_i$		$u(X_i)$
	dB	Probability Distribution	
Receiver Reading	0.41	Normal (k=2)	0.21
Antenna Factor Calibration	0.83	Normal (k=2)	0.42
Cable Loss Calibration	0.25	Normal (k=2)	0.13
Pre-Amplifier Gain Calibration	0.27	Normal (k=2)	0.14
RCV/SPA Specification	2.50	Rectangular	0.72
Antenna Factor Interpolation for Frequency	1.00	Rectangular	0.29
Site Imperfection	1.43	Rectangular	0.83
Mismatch	+0.39 / -0.41	U-Shape	0.28
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>1.27</b>		
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>2.54</b>		



**Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)**

Contribution	Uncertainty of $X_i$		$u(X_i)$	$C_i$	$C_i * u(X_i)$
	dB	Probability Distribution			
Receiver Reading	$\pm 0.10$	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	$\pm 1.70$	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	$\pm 0.50$	Normal (k=2)	0.25	1	0.25
Receiver Correction	$\pm 2.00$	Rectangular	1.15	1	1.15
Antenna Factor Directional	$\pm 1.50$	Rectangular	0.87	1	0.87
Site Imperfection	$\pm 2.80$	Triangular	1.14	1	1.14
Mismatch Receiver VSWR $\Gamma_1 = 0.197$ Antenna VSWR $\Gamma_2 = 0.194$ Uncertainty = $20\text{Log}(1-\Gamma_1*\Gamma_2)$	+0.34 / -0.35	U-Shape	0.244	1	0.244
<b>Combined Standard Uncertainty <math>U_c(y)</math></b>	<b>2.36</b>				
<b>Measuring Uncertainty for a Level of Confidence of 95% (<math>U = 2U_c(y)</math>)</b>	<b>4.72</b>				