FCC Test Report

APPLICANT	:	Nokia (China) Investment Co., Ltd.
BRAND NAME	:	Nokia
MODEL NAME	:	RM-686
FCC ID	:	QTLRM-686
STANDARD	:	FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION	:	Certification

The product was received on May 25, 2010 and completely tested on Jun. 17, 2010. 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:

Roy Wu / Manager

Testing Laboratory 1190

SPORTON INTERNATIONAL INC.
No. 52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C.

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FD052521A	Rev. 01	Initial issue of report	Jun. 18, 2010

SUMMARY OF TEST RESULT

Report Section	FCC Rule	Description	Limit	Result	Remark
3.1	15.107	AC Conducted Emission	< 15.107 limits	PASS	Under limit 12.79 dB at 0.20 MHz
3.2	15.109	Radiated Emission	< 15.109 limits	PASS	Under limit 7.71 dB at 302.10 MHz

1. General Description

1.1. Applicant

Nokia (China) Investment Co., Ltd.
Beijing Economic and Technological Development Area, No. 5, Donghuan Zhonglu, Beijing, 100176 P.R.C. China

1.2. Manufacturer

Compal Communications (Nanjing) Co., Ltd.
Nanjing Jiangning Export Processing Zone (South Area) No.68-2 Suyuan Street

1.3. Feature of Equipment Under Test

Product Feature & Specification	
Brand Name	Nokia
Model Name	RM-686
FCC ID	QTLRM-686
MEID	A0000001C904D2
Tx Frequency Range	CDMA2000 BC0 : 824 MHz ~ 849 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz
Rx Frequency Range	CDMA2000 BC0 : 869 ~ 894 MHz Bluetooth : 2400 MHz ~ 2483.5 MHz GPS : 1.57542 GHz
Antenna Type	WWAN : Fixed Internal Antenna Bluetooth : PIFA Antenna
HW Version	2200
SW Version	MD_2350B_TLC
Type of Modulation	CDMA2000 : QPSK Bluetooth (1Mbps) : GFSK Bluetooth EDR (2Mbps) : π/4-DQPSK Bluetooth EDR (3Mbps) : 8-DPSK GPS : BPSK

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

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1st 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		
Test Site No.	Sporton Site No.		FCC/IC Registration No.
	CO05-HY	03CH07-HY	TW1022/4086B-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

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.	Bluetooth Earphone	Nokia	BH-102	PYAHS-107W	N/A	N/A
3.	Car Battery	YUASA	46B24R(S)	N/A	N/A	N/A
4.	Car Battery	GS	55B24LS	N/A	N/A	N/A
5.	Notebook	DELL	Vostro 1510	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	Unshielded, 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.	Operating Mode (EUT with Notebook)	☒	☒	☒
2.	Charging Mode (EUT with adapter)	☒	☒	Note 1
3.	Charging Mode (EUT with car charger)	☒	☒	Note 1

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.

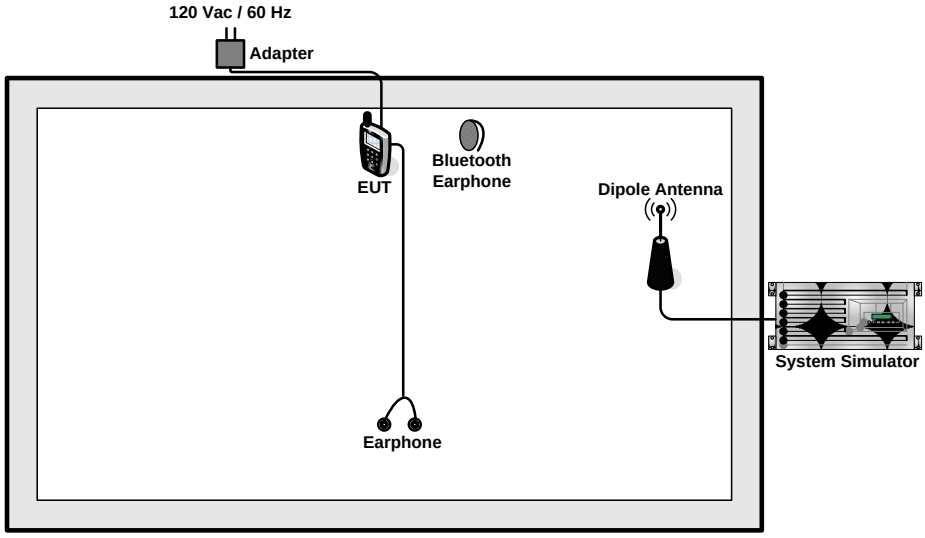
Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1/2/3	Mode 1 : CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone Mode 2 : CDMA2000 BC0 Idle + Bluetooth Idle + Camera + Earphone + Adapter Mode 3 : CDMA2000 BC0 Idle + Bluetooth Idle + Earphone + MPEG4 + DC (12V) Mode 4 : CDMA2000 BC0 Idle + Bluetooth Idle + Earphone + MPEG4 + DC (24V)
Radiated Emissions < 1GHz	1/2/3	Mode 1 : CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone Mode 2 : CDMA2000 BC0 Idle + Bluetooth Idle + Camera + Earphone + Adapter Mode 3 : CDMA2000 BC0 Idle + Bluetooth Idle + Earphone + MPEG4 + DC (12V) Mode 4 : CDMA2000 BC0 Idle + Bluetooth Idle + Earphone + MPEG4 + DC (24V)
Radiated Emissions ≥ 1GHz	1	Mode 1 : CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone

Remark:

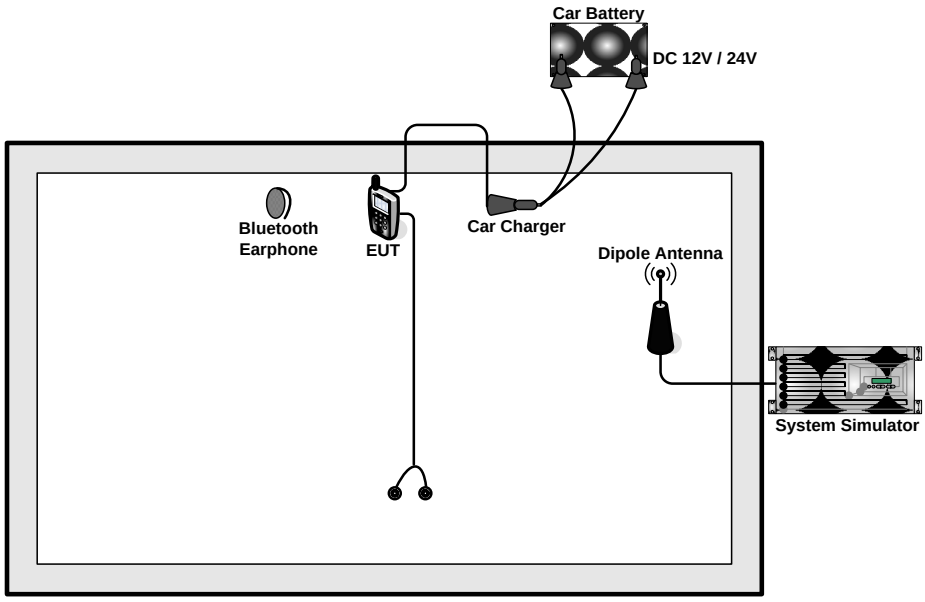
1. The worst case of AC is mode 1; only the test data of this mode was reported.
2. The worst case of RE < 1G is mode 1; only the test data of this mode was reported.

2.2. Connection Diagram of Test System

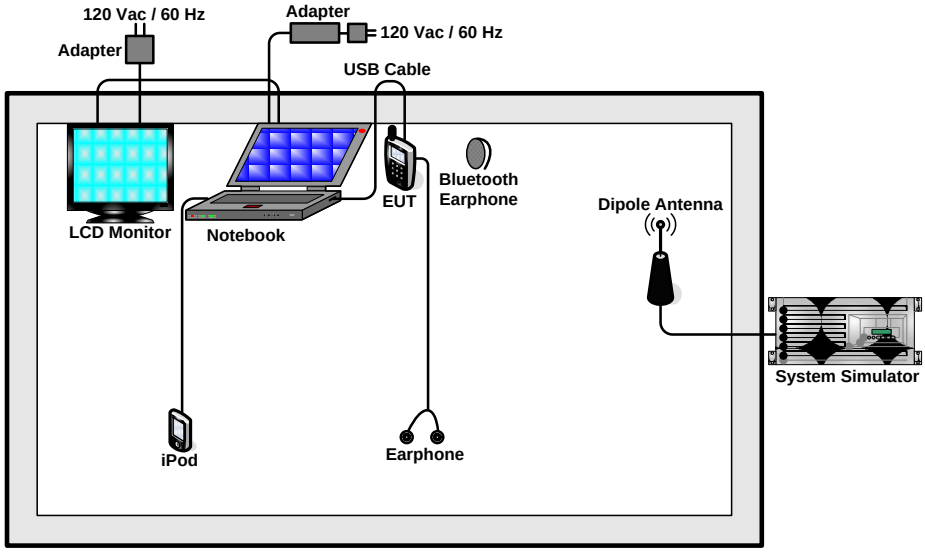
<EUT with Adapter Mode>



<EUT with Car Charger Mode>



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



2.3. Test Software

The EUT was in CDMA2000 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, 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.

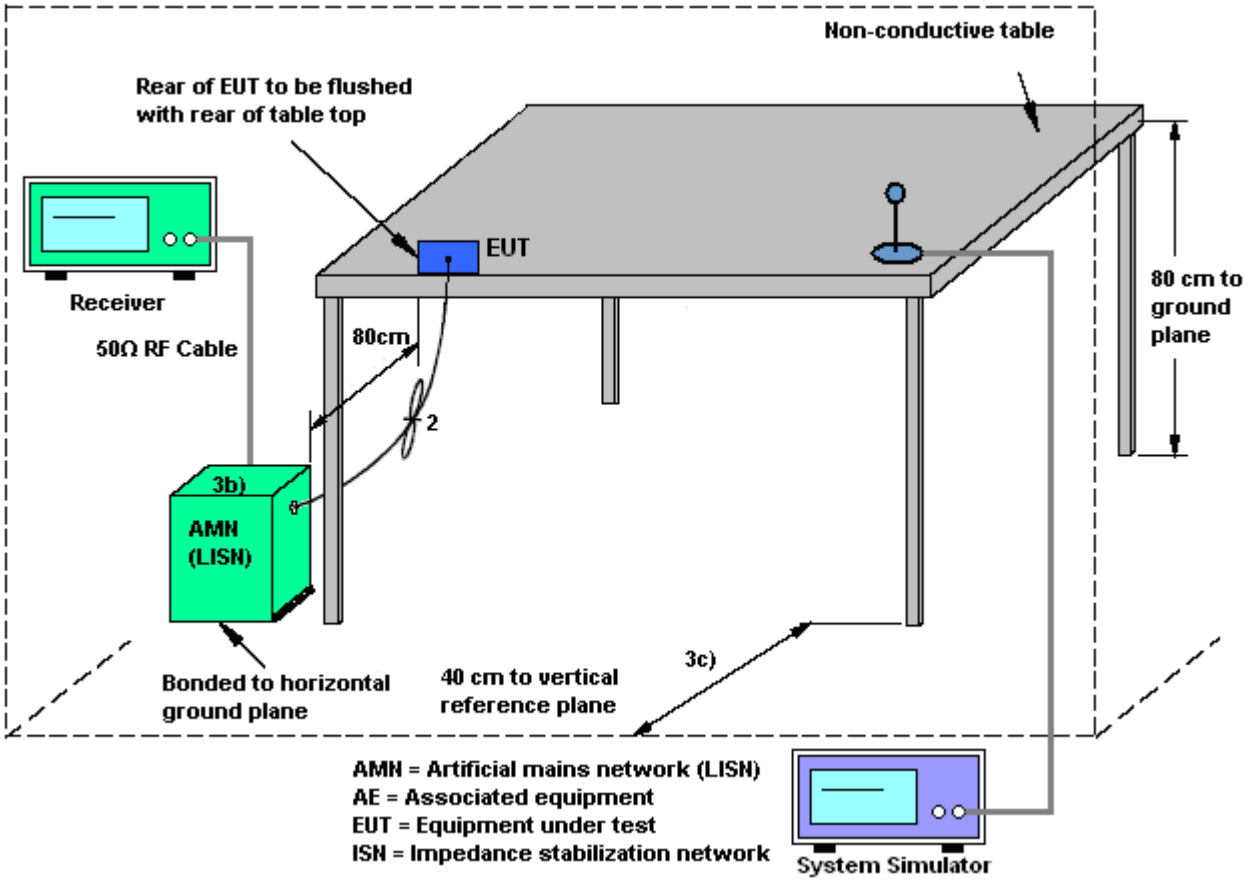
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

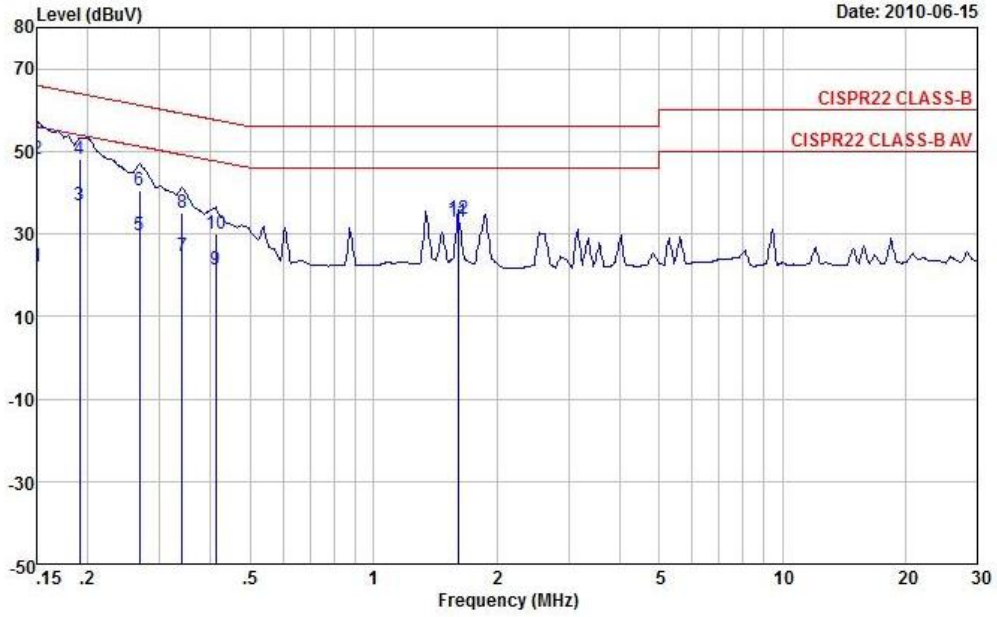
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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

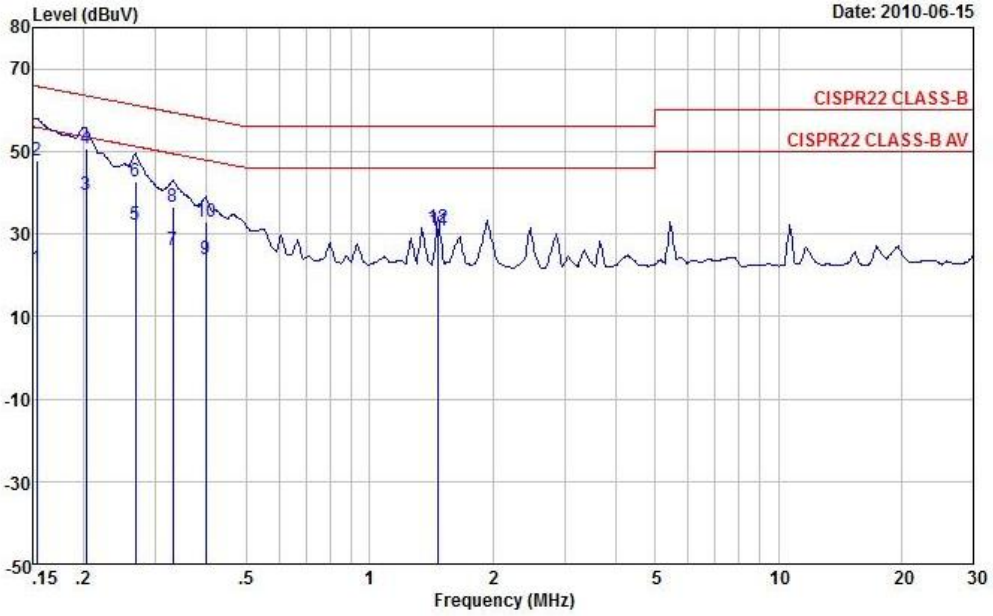
Test Mode :	Mode 1	**Temperature :**	20~22℃
Test Engineer :	Novic Jiang	**Relative Humidity :**	42~45%
Test Voltage :	120Vac / 60Hz	**Phase :**	Line
Function Type :	CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO05-HY
Condition : CISPR22 CLASS-B 100609_LINE LINE
Project : FD 052521
Power : From System
Memo : Mode 1
Temp : 20~22
Humidity : 42~45

	Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
	MHz	dBuV	dB	dBuV	dBuV	dB	
1	0.15	22.20	-33.80	56.00	2.70	19.50	Average
2	0.15	48.30	-17.70	66.00	28.80	19.50	QP
3	0.19	37.00	-16.98	53.98	17.50	19.50	Average
4 q	0.19	48.20	-15.78	63.98	28.70	19.50	QP
5	0.27	29.60	-21.60	51.20	10.20	19.40	Average
6	0.27	40.50	-20.70	61.20	21.10	19.40	QP
7	0.34	24.60	-24.58	49.18	5.10	19.50	Average
8	0.34	35.00	-24.18	59.18	15.50	19.50	QP
9	0.41	21.40	-26.24	47.64	1.80	19.60	Average
10	0.41	30.10	-27.54	57.64	10.50	19.60	QP
11 a	1.61	32.81	-13.19	46.00	13.20	19.61	Average
12	1.61	33.71	-22.29	56.00	14.10	19.61	QP

Test Mode :	Mode 1	**Temperature :**	20~22℃
Test Engineer :	Novic Jiang	**Relative Humidity :**	42~45%
Test Voltage :	120Vac / 60Hz	**Phase :**	Neutral
Function Type :	CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Site : CO05-HY
Condition : CISPR22 CLASS-B 100609_NEUTRAL NEUTRAL
Project : FD 052521
Power : From System
Memo : Mode 1
Temp : 20~22
Humidity : 42~45

		Freq	Level	Over Limit	Limit Line	Read Level	Factor	Remark
		MHz	dBuV	dB	dBuV	dBuV	dB	
1		0.15	21.80	-34.02	55.82	2.30	19.50	Average
2		0.15	47.70	-18.12	65.82	28.20	19.50	QP
3	a	0.20	39.60	-13.89	53.49	20.10	19.50	Average
4	q	0.20	50.70	-12.79	63.49	31.20	19.50	QP
5		0.27	32.20	-19.00	51.20	12.80	19.40	Average
6		0.27	42.60	-18.60	61.20	23.20	19.40	QP
7		0.33	26.20	-23.24	49.44	6.70	19.50	Average
8		0.33	36.60	-22.84	59.44	17.10	19.50	QP
9		0.40	23.90	-24.00	47.90	4.30	19.60	Average
10		0.40	32.90	-25.00	57.90	13.30	19.60	QP
11		1.47	30.67	-15.33	46.00	11.10	19.57	Average
12		1.47	31.37	-24.63	56.00	11.80	19.57	QP

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

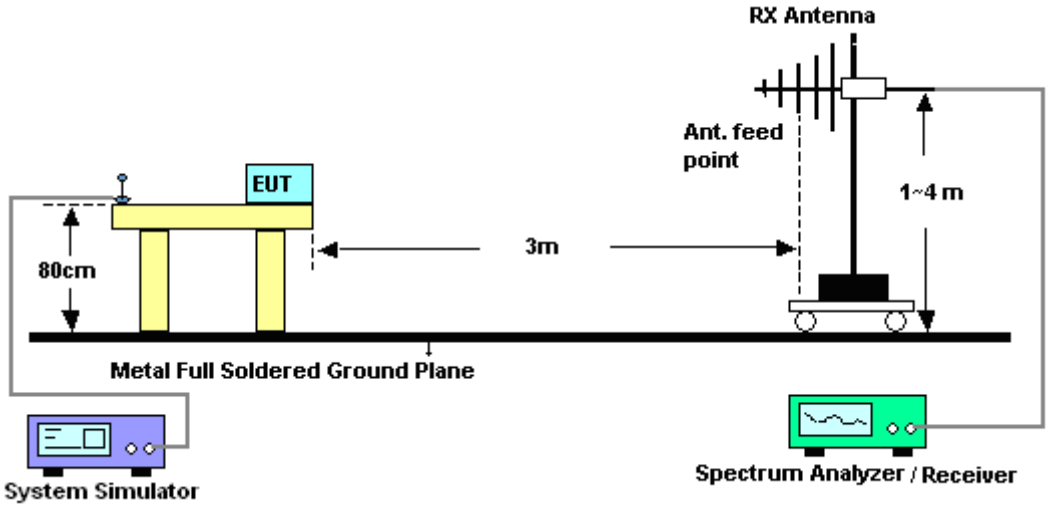
3.2.2. Measuring Instruments

See list of measuring instruments of this test report.

3.2.3. Test Procedures

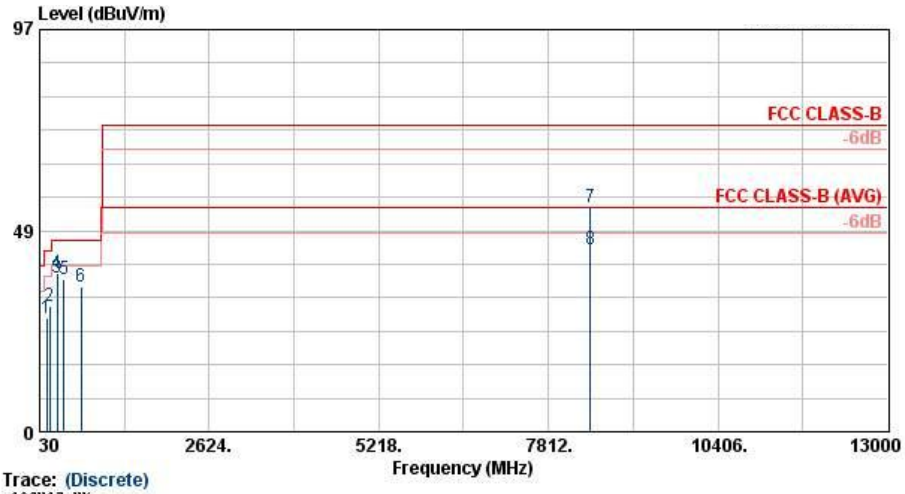
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna 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



3.2.5. Test Result of Radiated Emission

Test Mode :	Mode 1	Temperature :	24~25°C
Test Engineer :	Kay Wu	Relative Humidity :	43~44%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone		

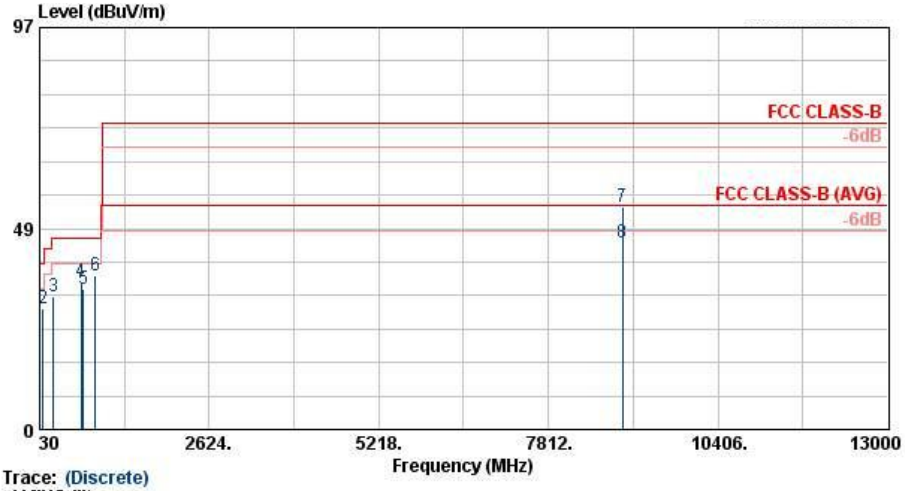


Trace: (Discrete)

Site : 03CH07-HY
Condition : FCC CLASS-B HF-ANT(6-18)-060918 HORIZONTAL
Project : FD 052521
Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read 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	133.14	27.45	-16.05	43.50	46.10	11.75	1.17	31.56	---	---	Peak
2	181.74	30.12	-13.38	43.50	51.37	9.03	1.25	31.53	---	---	Peak
3 @	299.73	37.14	-8.86	46.00	53.24	13.46	1.77	31.33	---	---	Peak
4 @	302.10	38.29	-7.71	46.00	54.31	13.54	1.78	31.33	100	46	Peak
5	399.40	36.81	-9.19	46.00	49.74	16.11	2.14	31.18	---	---	Peak
6	663.30	34.93	-11.07	46.00	42.36	20.56	2.87	30.86	---	---	Peak
7	8452.00	54.16	-19.84	74.00	39.88	36.00	11.75	33.47	100	69	Peak
8	8452.00	44.06	-9.94	54.00	29.78	36.00	11.75	33.47	100	69	Average

Test Mode :	Mode 1	Temperature :	24~25°C
Test Engineer :	Kay Wu	Relative Humidity :	43~44%
Test Distance :	3m	Polarization :	Vertical
Function Type :	CDMA2000 BC0 Idle + Bluetooth Idle + USB Cable (Link with Notebook) + Earphone		



Trace: (Discrete)

Site : 03CH07-HY
Condition : FCC CLASS-B HF-ANT(8-18)-060918 VERTICAL
Project : FD 052521
Mode : Mode 1

	Freq	Level	Over Limit	Limit Line	Read 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	30.54	27.07	-12.93	40.00	39.04	18.95	0.54	31.46	---	---	Peak
2	84.81	29.08	-10.92	40.00	51.48	8.23	0.91	31.54	---	---	Peak
3	243.30	32.06	-13.94	46.00	49.99	11.95	1.53	31.42	---	---	Peak
4	663.30	35.66	-10.34	46.00	43.10	20.56	2.87	30.86	100	76	Peak
5	699.00	33.86	-12.14	46.00	40.91	20.83	2.94	30.82	---	---	Peak
6	881.00	37.05	-8.95	46.00	41.45	22.99	3.31	30.71	---	---	Peak
7	8948.00	53.79	-20.21	74.00	38.67	36.27	12.32	33.47	100	71	Peak
8 @	8948.00	45.11	-8.89	54.00	29.99	36.27	12.32	33.47	100	71	Average

4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Due Date	Remark
EMI Test Receive	R&S	ESCS 30	100356	9KHz – 2.75GHz	Aug. 05, 2009	Aug. 04, 2010	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9kHz~30MHz	Nov. 30, 2009	Nov. 29, 2010	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9kHz~30MHz	Nov. 23, 2009	Nov. 22, 2010	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	N/A	Conduction (CO05-HY)
DC- LISN	R&S	ESH3-26	1000485	0.1MHz~200MHz	Jun. 17, 2010	Jun. 16, 2011	Conduction (CO05-HY)
DC- LISN	R&S	ESH3-26	1000484	0.1MHz~200MHz	Jun. 17, 2010	Jun. 16, 2011	Conduction (CO05-HY)
Bilog Antenna	SCHAFFNER	CBL6111C	2726	30MHz ~ 1GHz	Oct. 31, 2009	Oct. 30, 2010	Radiation (03CH07-HY)
Spectrum Analyzer	R&S	FSP	101067	9KHz ~ 30GHz	Dec. 04, 2009	Dec. 03, 2010	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	00075962	1GHz ~ 18GHz	Aug. 20, 2009	Aug. 19, 2010	Radiation (03CH07-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz- 40GHz	Oct. 14, 2009	Oct. 13, 2010	Radiation (03CH07-HY)
Pre Amplifier	Agilent	8449B	3008A02362	1GHz~ 26.5GHz	Dec.09,2009	Dec. 08, 2010	Radiation (03CH07-HY)
Pre Amplifier	COM-POWER	PA-103A	161241	10-1000MHz.32 dB.GAIN	Mar. 27, 2010	Mar. 26, 2011	Radiation (03CH07-HY)
System Simulator	R&S	CMU200	117997	N/A	May 14, 2009	May 13, 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
Combined Standard Uncertainty Uc(y)	**1.13**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.26**		

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
Combined Standard Uncertainty Uc(y)	**1.27**		
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**2.54**		

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	±0.10	Normal (k=2)	0.10	1	0.10
Antenna Factor Calibration	±1.70	Normal (k=2)	0.85	1	0.85
Cable Loss Calibration	±0.50	Normal (k=2)	0.25	1	0.25
Receiver Correction	±2.00	Rectangular	1.15	1	1.15
Antenna Factor Directional	±1.50	Rectangular	0.87	1	0.87
Site Imperfection	±2.80	Triangular	1.14	1	1.14
Mismatch Receiver VSWR Γ1 = 0.197 Antenna VSWR Γ2 = 0.194 Uncertainty = 20Log(1-Γ1*Γ2)	+0.34 / -0.35	U-Shape	0.244	1	0.244
Combined Standard Uncertainty Uc(y)	**2.36**				
Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.72**				