



Variant FCC Test Report

APPLICANT : Quanta Computer Inc.
EQUIPMENT : LTE sip module
BRAND NAME : Quanta;Aptos;Topmore
MODEL NAME : LI170;S901100003;S901100018
MARKETING NAME : LI170;S901100003;S901100018
FCC ID : HFS-LI170
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

This is a variant report which is only valid together with the original test report. The product was received on Aug. 20, 2013 and completely tested on Aug. 27, 2013. 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 to be compliant 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: Louis Wu / Manager

Approved by: Jones Tsai / Manager



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

SPORTON INTERNATIONAL INC.

TEL : 886-3-327-3456

FAX : 886-3-328-4978

FCC ID : HFS-LI170

Page Number : 1 of 18

Report Issued Date : Oct. 23, 2013

Report Version : Rev. 01



TABLE OF CONTENTS

REVISION HISTORY.....	3
SUMMARY OF TEST RESULT	4
1. GENERAL DESCRIPTION	5
1.1. Applicant.....	5
1.2. Manufacturer	5
1.3. Feature of Equipment Under Test.....	5
1.4. Product Specification of Equipment Under Test	6
1.5. Modification of EUT	6
1.6. Test Site	6
1.7. Applied Standards	6
2. TEST CONFIGURATION OF EQUIPMENT UNDER TEST	7
2.1. Test Mode	7
2.2. Connection Diagram of Test System	8
2.3. Support Unit used in test configuration and system.....	8
2.4. EUT Operation Test Setup	8
3. TEST RESULT.....	9
3.1. Test of AC Conducted Emission Measurement	9
3.2. Test of Radiated Emission Measurement	13
4. LIST OF MEASURING EQUIPMENT	17
5. UNCERTAINTY OF EVALUATION.....	18

APPENDIX A. SETUP PHOTOGRAPHS

APPENDIX B. ORIGINAL REPORT



REVISION HISTORY



SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	ICES003 Section 6.1	AC Conducted Emission	< 15.107 limits < ICES003 6.1 limits	PASS	Under limit 10.50 dB at 0.190 MHz
3.2	15.109	ICES003 Section 6.2	Radiated Emission	< 15.109 limits < ICES003 6.2 limits	PASS	Under limit 8.23 dB at 462.400 MHz for peak



1. General Description

1.1. Applicant

Quanta Computer Inc.

211 Wen Hwa 2nd Rd., Kueishan, Taoyuan 33377, Taiwan

1.2. Manufacturer

1. Quanta Computer Inc.

211 Wen Hwa 2nd Rd., Kueishan, Taoyuan 33377, Taiwan

2. Aptos Technology Inc.

No. 398, Youyi Rd., Jhunan Township, Miaoli County 350, Taiwan

3. Topmore Technology Inc.

1F., No. 2, Liuji 7thRd., Zhubei City, Hsinchu County 302, Taiwan R.O.C.

1.3. Feature of Equipment Under Test

Product Feature	
Equipment	LTE sip module
Brand Name	Quanta;Aptos;Topmore
Model Name	LI170;S901100003;S901100018
Marketing Name	LI170;S901100003;S901100018
Sample 1	EUT with PA Source 1
Sample 2	EUT with PA Source 2
Sample 3	EUT with DDR
FCC ID	HFS-LI170
EUT supports Radios application	LTE
HW Version	LI170116
EUT Stage	Production Unit

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. Product Specification of Equipment Under Test

Product Specification subjective to this standard	
Tx Frequency	LTE Band 13: 779.5 MHz ~ 784.5 MHz
Rx Frequency	LTE Band 13: 748.5 MHz ~ 753.5 MHz
Antenna Type	Dipole Antenna
Type of Modulation	QPSK/16QAM

1.5. Modification of EUT

No modifications are made to the EUT during all test items.

1.6. Test Site

Test Site	SPORTON INTERNATIONAL INC.		
Test Site Location	No. 52, Hwa Ya 1 st 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	03CH06-HY	722060/4086B-1

1.7. 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.



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 EUT uses a USB interface and microprocessor operating 26MHz which is the maximum frequency used.

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
1.	Operating Mode (EUT with notebook)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>

Abbreviations:

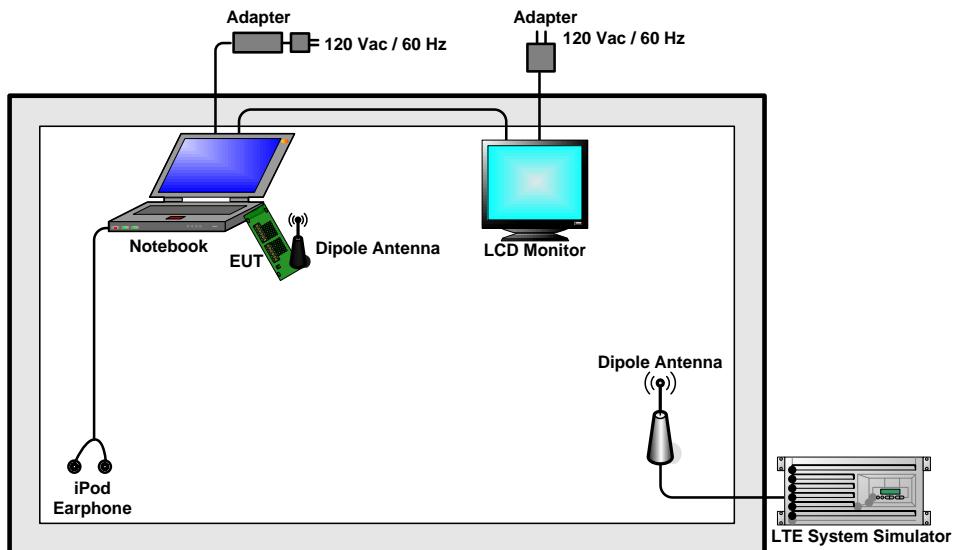
- EMI AC: AC conducted emissions
- EMI RE: EUT radiated emissions

Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1	Mode 1: LTE Band 13 Idle + Connect with Notebook for Sample 1 Mode 2: LTE Band 13 Idle + Connect with Notebook for Sample 2 Mode 3: LTE Band 13 Idle + Connect with Notebook for Sample 3
Radiated Emissions < 1GHz	1	Mode 1: LTE Band 13 Idle + Connect with Notebook for Sample 1 Mode 2: LTE Band 13 Idle + Connect with Notebook for Sample 2 Mode 3: LTE Band 13 Idle + Connect with Notebook for Sample 3
Radiated Emissions \geq 1GHz	1	Mode 1: LTE Band 13 Idle + Connect with Notebook for Sample 1

Remark:

1. The worst case of AC is mode 3; 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



2.3. Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model Name	FCC ID	Data Cable	Power Cord
1.	LTE Base Station	Anritsu	MT8820C	N/A	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Latitude E6320	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
3.	LCD Monitor	Dell	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
4.	iPod Earphone	Apple	N/A	N/A	Unshielded, 1.0 m	N/A
5.	SD Card	SanDisk	Mico SD HC	FCC DoC	N/A	N/A

2.4. EUT Operation Test Setup

The EUT was in LTE 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.



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.

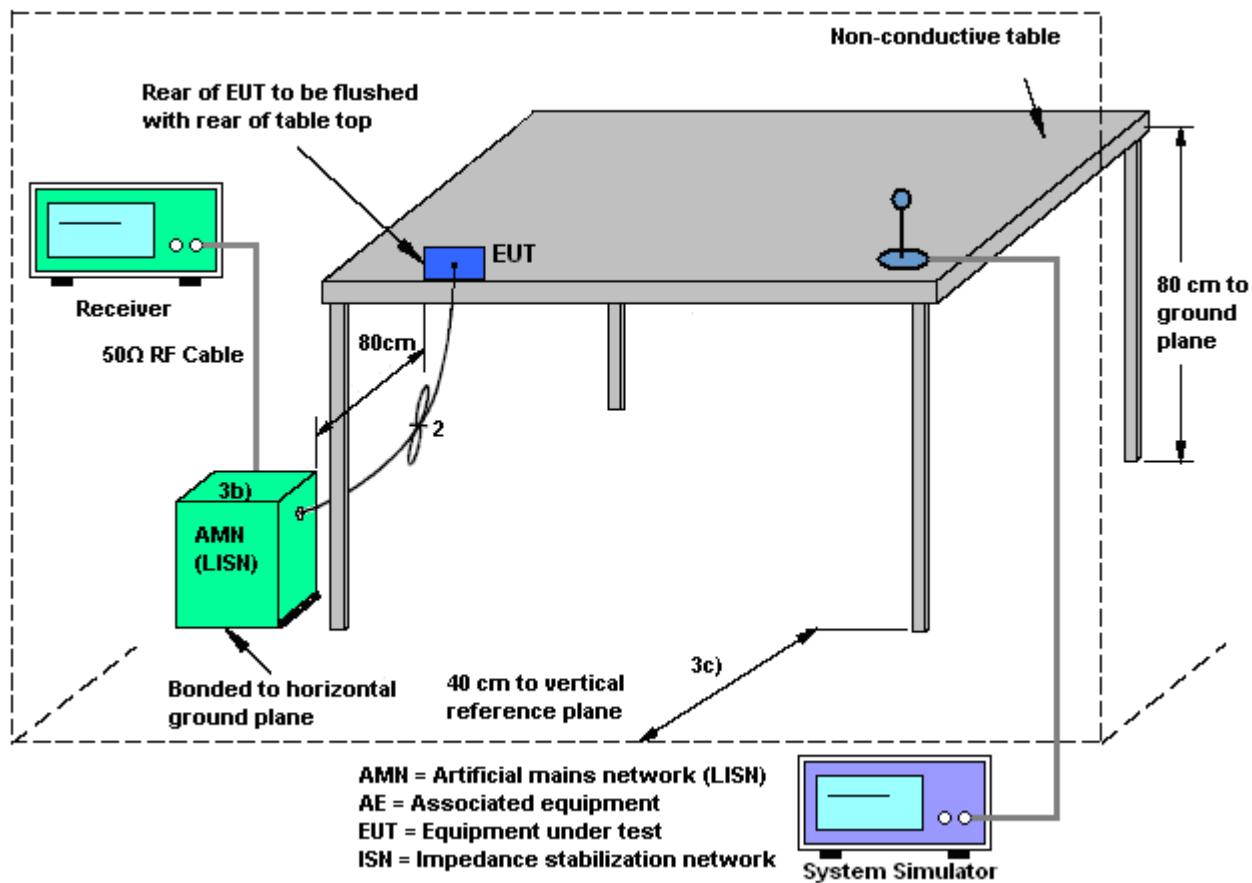
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

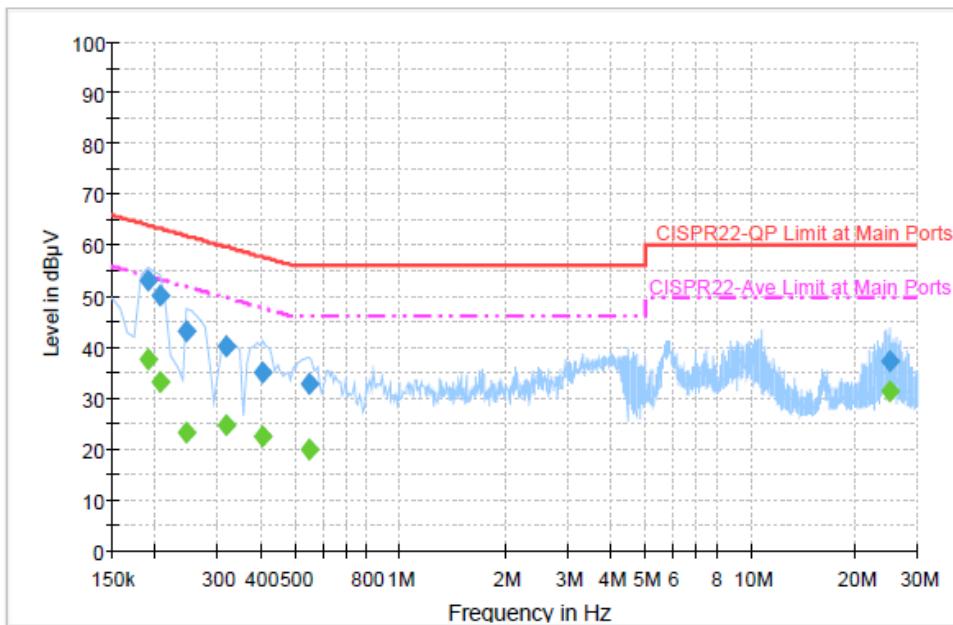
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 :	Kai-Chun Chu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type : LTE Band 13 Idle + Connect with Notebook for Sample 3			



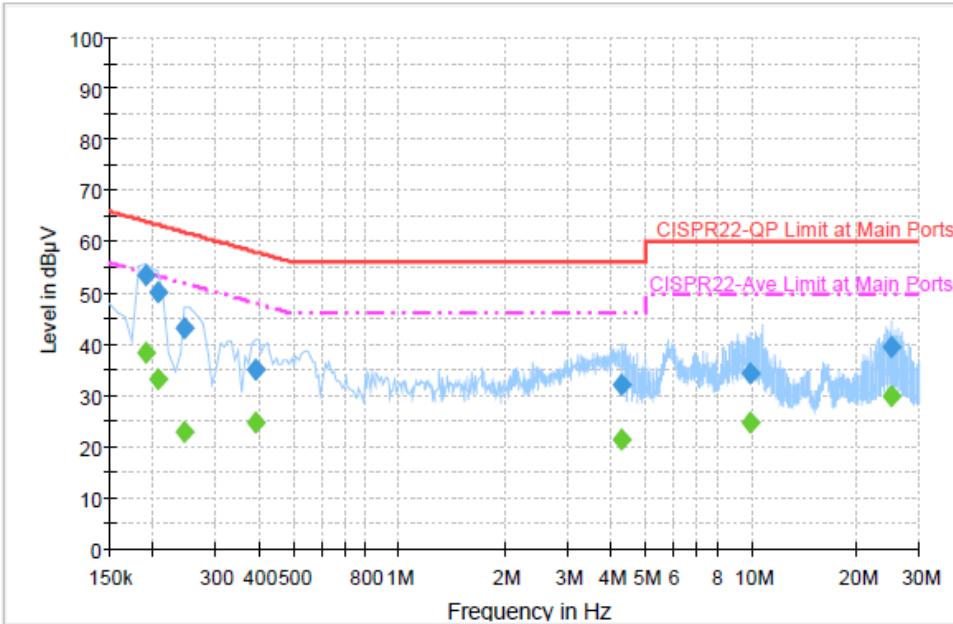
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dB μ V)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.190000	53.1	Off	L1	19.4	10.9	64.0
0.206000	50.4	Off	L1	19.4	13.0	63.4
0.246000	43.0	Off	L1	19.4	18.9	61.9
0.318000	40.2	Off	L1	19.4	19.6	59.8
0.406000	35.0	Off	L1	19.4	22.7	57.7
0.550000	33.0	Off	L1	19.4	23.0	56.0
25.070000	37.2	Off	L1	19.9	22.8	60.0

Final Result : Average

Frequency (MHz)	Average (dB μ V)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dB μ V)
0.190000	37.8	Off	L1	19.4	16.2	54.0
0.206000	33.1	Off	L1	19.4	20.3	53.4
0.246000	23.3	Off	L1	19.4	28.6	51.9
0.318000	24.6	Off	L1	19.4	25.2	49.8
0.406000	22.5	Off	L1	19.4	25.2	47.7
0.550000	19.8	Off	L1	19.4	26.2	46.0
25.070000	31.3	Off	L1	19.9	18.7	50.0

Test Mode :	Mode 3	Temperature :	20~22°C
Test Engineer :	Kai-Chun Chu	Relative Humidity :	46~48%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	LTE Band 13 Idle + Connect with Notebook for Sample 3		


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	53.5	Off	N	19.4	10.5	64.0
0.206000	50.3	Off	N	19.4	13.1	63.4
0.246000	43.0	Off	N	19.4	18.9	61.9
0.390000	35.2	Off	N	19.4	22.9	58.1
4.294000	32.2	Off	N	19.6	23.8	56.0
9.926000	34.4	Off	N	19.7	25.6	60.0
24.878000	39.4	Off	N	20.0	20.6	60.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.190000	38.2	Off	N	19.4	15.8	54.0
0.206000	33.1	Off	N	19.4	20.3	53.4
0.246000	23.0	Off	N	19.4	28.9	51.9
0.390000	24.7	Off	N	19.4	23.4	48.1
4.294000	21.4	Off	N	19.6	24.6	46.0
9.926000	24.9	Off	N	19.7	25.1	50.0
24.878000	29.9	Off	N	20.0	20.1	50.0



3.2. Test of Radiated Emission Measurement

3.2.1. Limit of Radiated Emission

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

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (meters)
30 – 88	100	3
88 – 216	150	3
216 - 960	200	3
Above 960	500	3

3.2.2. Measuring Instruments

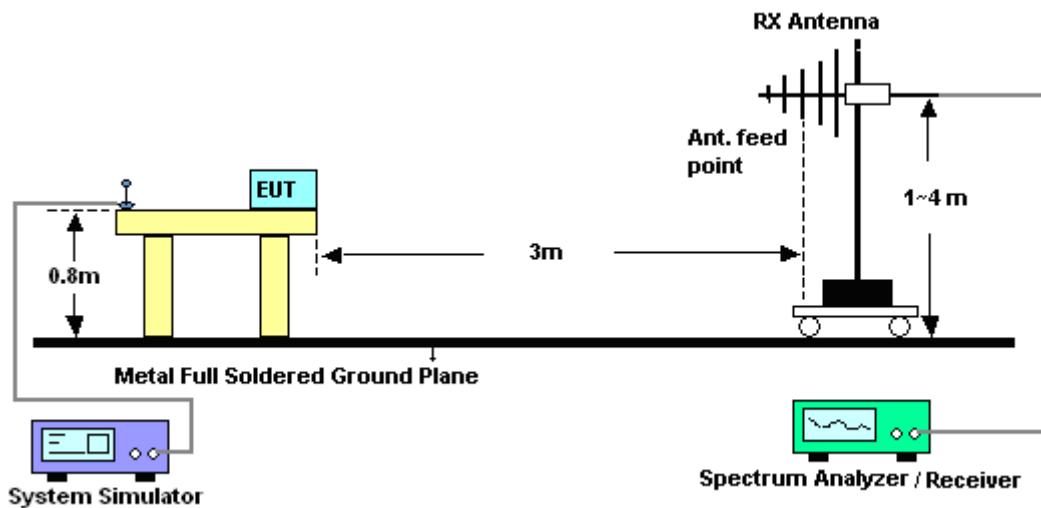
See list of measuring instruments of this test report.

3.2.3. Test Procedures

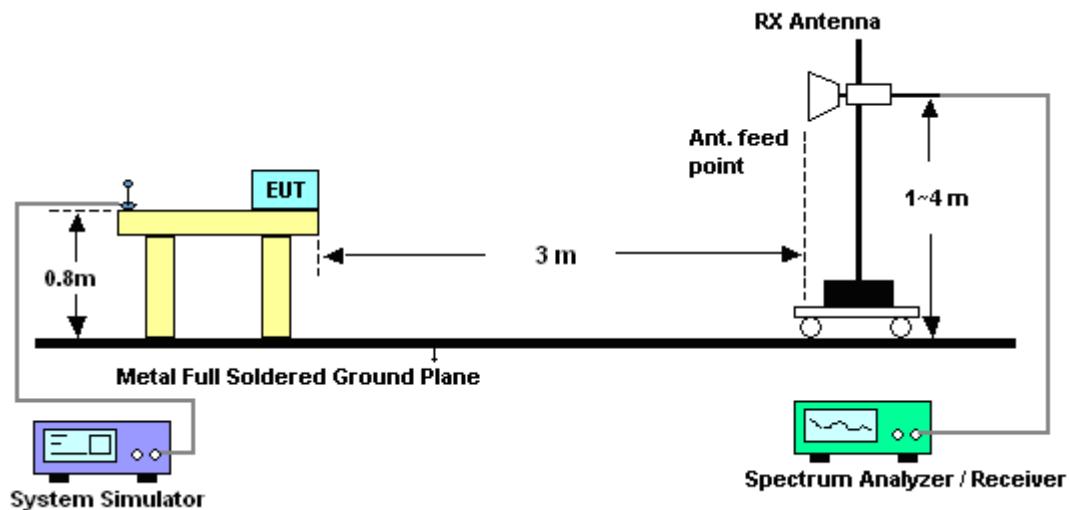
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna is a Bi-Log antenna and its height is adjusted between one to 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, peak values of EUT will be reported. Otherwise, the emission will be repeated by using the quasi-peak method and reported.
8. Emission level (dB μ V/m) = 20 log Emission level (μ V/m)
9. Corrected Reading: Antenna Factor + Cable Loss + Read Level - Preamp Factor = Level

3.2.4. Test Setup of Radiated Emission

For radiated emissions from 30MHz to 1GHz

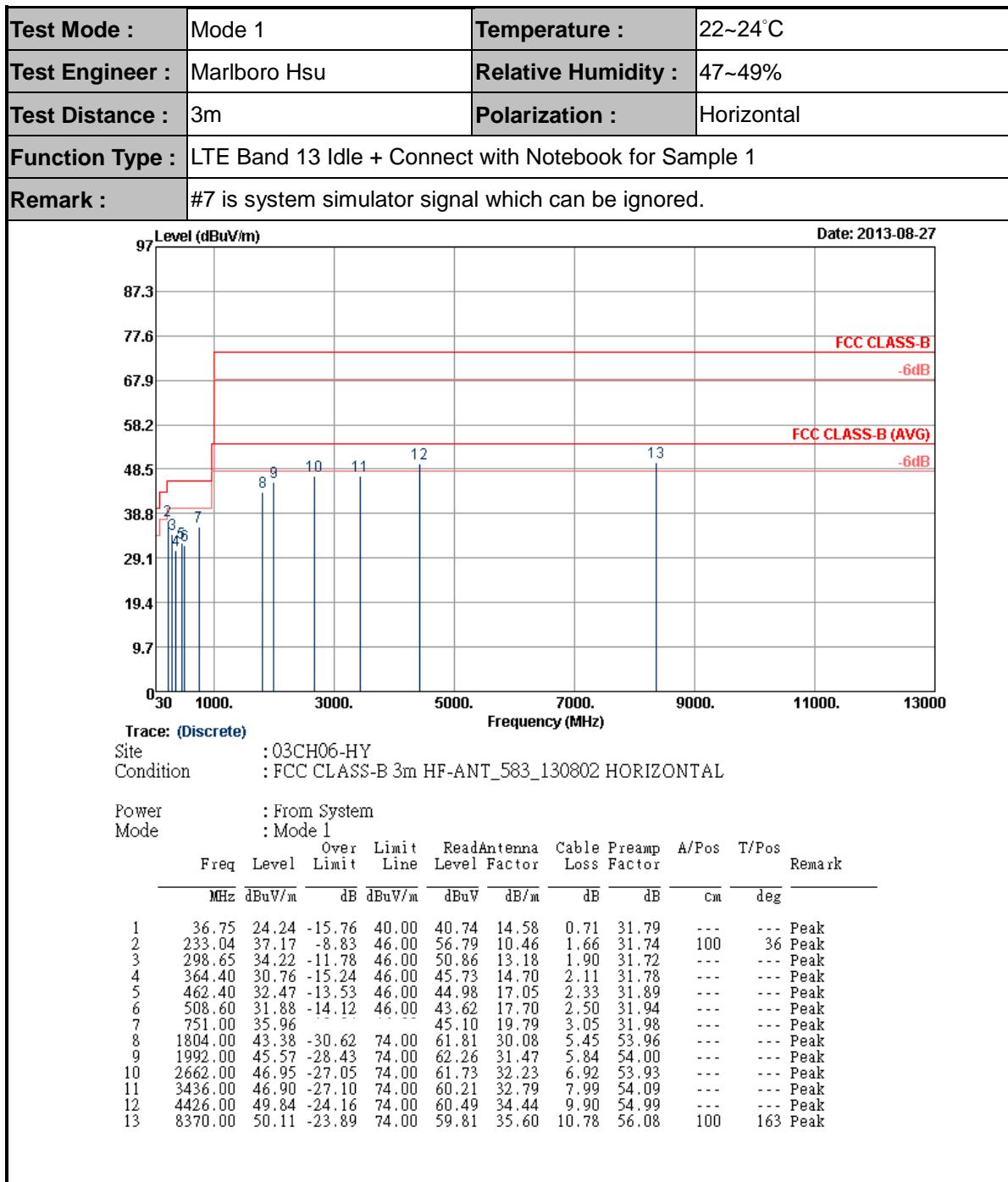


For radiated emissions above 1GHz



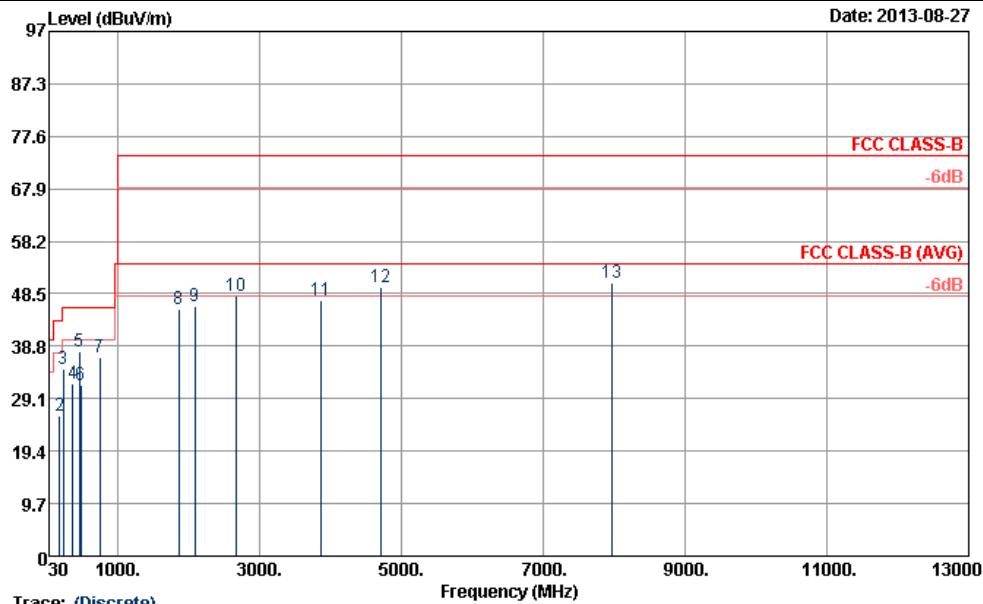


3.2.5. Test Result of Radiated Emission





Test Mode :	Mode 1	Temperature :	22~24°C
Test Engineer :	Marlboro Hsu	Relative Humidity :	47~49%
Test Distance :	3m	Polarization :	Vertical
Function Type :	LTE Band 13 Idle + Connect with Notebook for Sample 1		
Remark :	#7 is system simulator signal which can be ignored.		



Power Mode	: From System										
	: Mode 1		Over Limit	Limit Line	Read	Antenna Level	Cable Factor	Preamp Loss	A/Pos Factor	T/Pos	Remark
Freq	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1	35.40	25.97	-14.03	40.00	42.02	15.04	0.70	31.79	---	---	Peak
2	184.44	25.82	-17.68	43.50	46.97	9.14	1.46	31.75	---	---	Peak
3	233.04	34.56	-11.44	46.00	54.18	10.46	1.66	31.74	---	---	Peak
4	366.50	31.96	-14.04	46.00	46.94	14.70	2.11	31.79	---	---	Peak
5	462.40	37.77	-8.23	46.00	50.28	17.05	2.33	31.89	100	21	Peak
6	483.40	31.53	-14.47	46.00	43.65	17.46	2.33	31.91	---	---	Peak
7	751.00	36.67	---	45.81	45.81	19.79	3.05	31.98	---	---	Peak
8	1858.00	45.56	-28.44	74.00	63.50	30.46	5.57	53.97	---	---	Peak
9	2092.00	46.26	-27.74	74.00	62.53	31.67	6.04	53.98	---	---	Peak
10	2666.00	48.15	-25.85	74.00	62.93	32.23	6.92	53.93	---	---	Peak
11	3858.00	47.38	-26.62	74.00	60.16	33.23	8.67	54.68	---	---	Peak
12	4706.00	49.68	-24.32	74.00	60.45	34.48	10.12	55.37	---	---	Peak
13	7976.00	50.51	-23.49	74.00	59.65	35.59	10.98	55.71	100	60	Peak



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	Rohde & Schwarz	ESCS 30	100356	9kHz ~ 2.75GHz	Nov. 13, 2012	Aug. 27, 2013	Nov. 12, 2013	Conduction (CO05-HY)
Two-LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2012	Aug. 27, 2013	Dec. 11, 2013	Conduction (CO05-HY)
Two-LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 06, 2012	Aug. 27, 2013	Dec. 05, 2013	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Aug. 27, 2013	N/A	Conduction (CO05-HY)
Spectrum Analyzer	R&S	FSP30	101352	9kHz~30GHz	Nov. 07, 2012	Aug. 27, 2013	Nov. 06, 2013	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9kHz ~ 26.5GHz	Nov. 26, 2012	Aug. 27, 2013	Nov. 25, 2013	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 06, 2013	Aug. 27, 2013	May 05, 2014	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 06, 2012	Aug. 27, 2013	Oct. 05, 2013	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 02, 2013	Aug. 27, 2013	Aug. 01, 2014	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9kHz ~ 1GHz	Apr. 12, 2013	Aug. 27, 2013	Apr. 11, 2014	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 18, 2013	Aug. 27, 2013	Jul. 17, 2014	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0 - 360 degree	N/A	Aug. 27, 2013	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1 m ~ 4 m	N/A	Aug. 27, 2013	N/A	Radiation (03CH06-HY)



5. Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.26
---	------

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	2.54
---	------

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	4.72
---	------



Appendix B. Original Report

Please refer to Sporton report number FC2O0222 as below.