

FCC Test Report

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

The product was received on Oct. 02, 2012 and completely tested on Nov. 28, 2012. 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:



Jones Tsai / Manager



SPORTON INTERNATIONAL INC.

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SPORTON INTERNATIONAL INC.

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FCC ID : HFS-LI170

Page Number : 1 of 18

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SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	15.107	7.2.4	AC Conducted Emission	< 15.107 limits < RSS-Gen table 2 limits	PASS	Under limit 13.60 dB at 0.198 MHz
3.2	15.109	7.2.3.2	Radiated Emission	< 15.109 limits < RSS-Gen table 1 limits	PASS	4.90 dB at 75.090 MHz for Quasi-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, Liujia 7th Rd., 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
Marketing Name	LI170;S901100003
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.

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

1.4. 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

1.5. 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.	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	Apple	A1236	FCC DoC	Shielded, 1.0 m	N/A
5.	SD Card	SanDisk	4G class 10	FCC DoC	N/A	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 EUT uses a USB interface and microprocessor operating 26MHz which is the maximum frequency used.

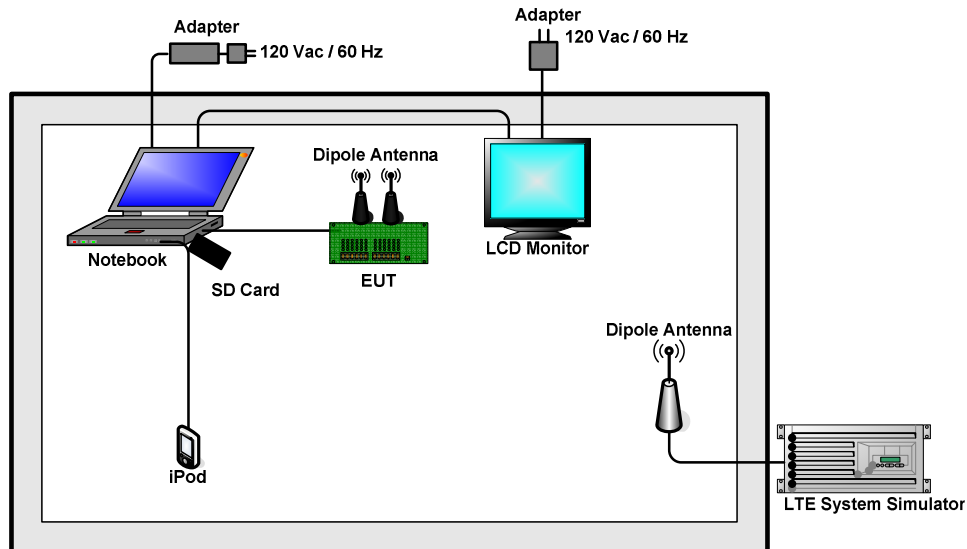
The following tables are showing the test modes as the worst cases and recorded in this report.

Item	EUT Configuration	Test Condition	
		EMI AC	EMI RE
1.	Charging Mode (EUT with notebook)	☒	☒

- 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 + Charging from Notebook
Radiated Emissions	1	Mode 1: LTE Band 13 Idle + Charging from Notebook

2.2. Connection Diagram of Test System



2.3. Test Software

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

Executed the testing software "Winthrax" which was installed in a WIN7 notebook for file transferring with SD Card and iPod, where the SD Card was plugged in the notebook and iPod was connected via USB Cable.

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.

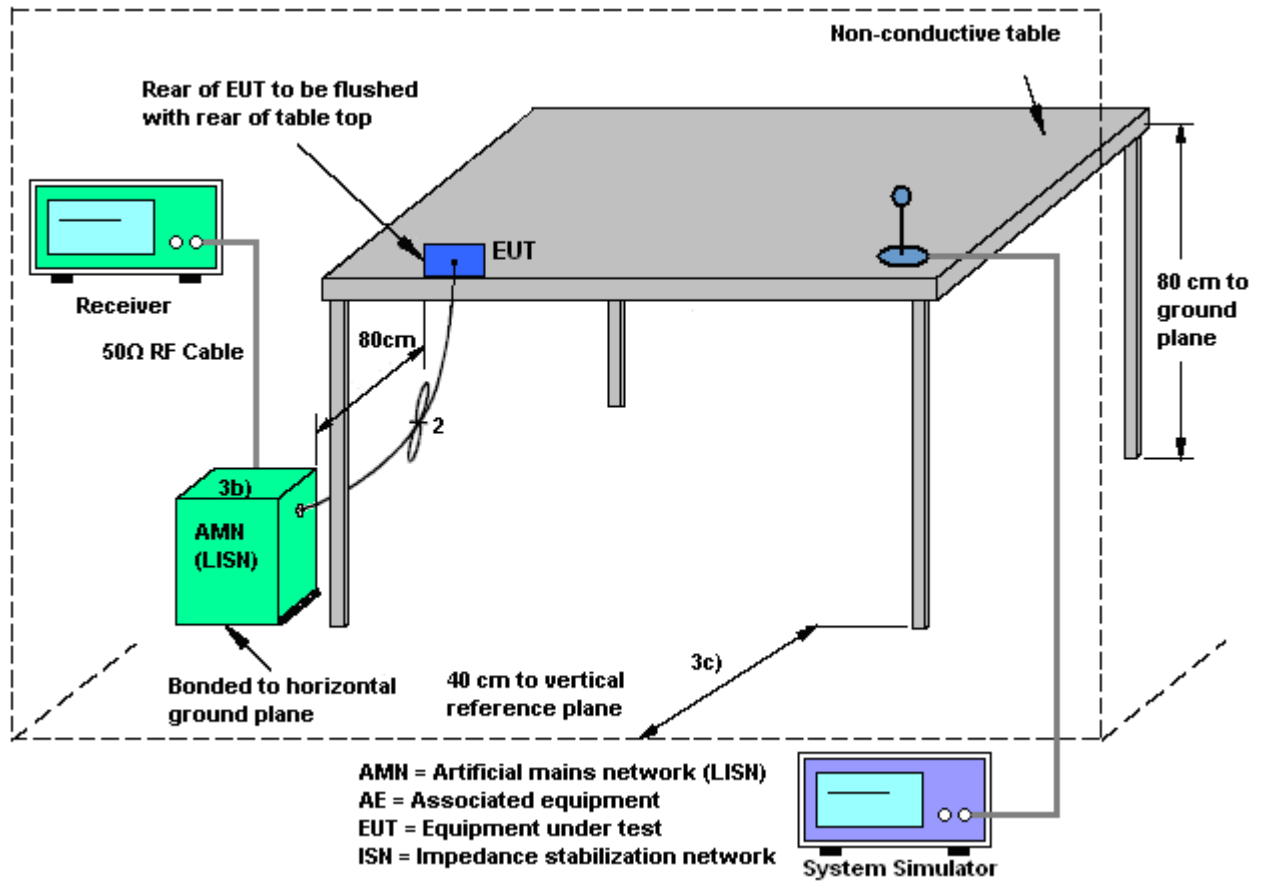
3.1.2 Measuring Instruments

See list of measuring instruments of this test report.

3.1.3 Test Procedure

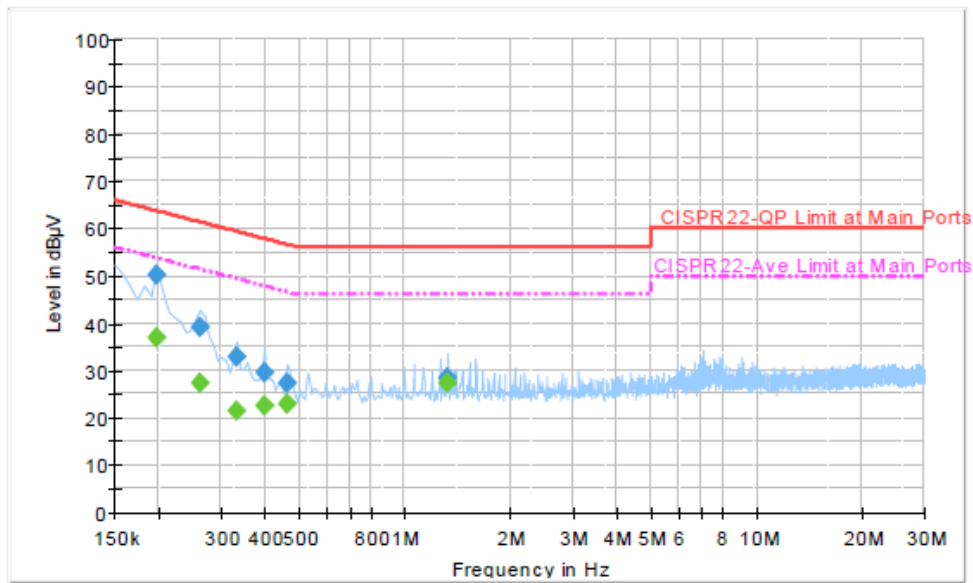
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 :	20~21°C
Test Engineer :	Kyle Jhuang	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	LTE Band 13 Idle + Charging from Notebook		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



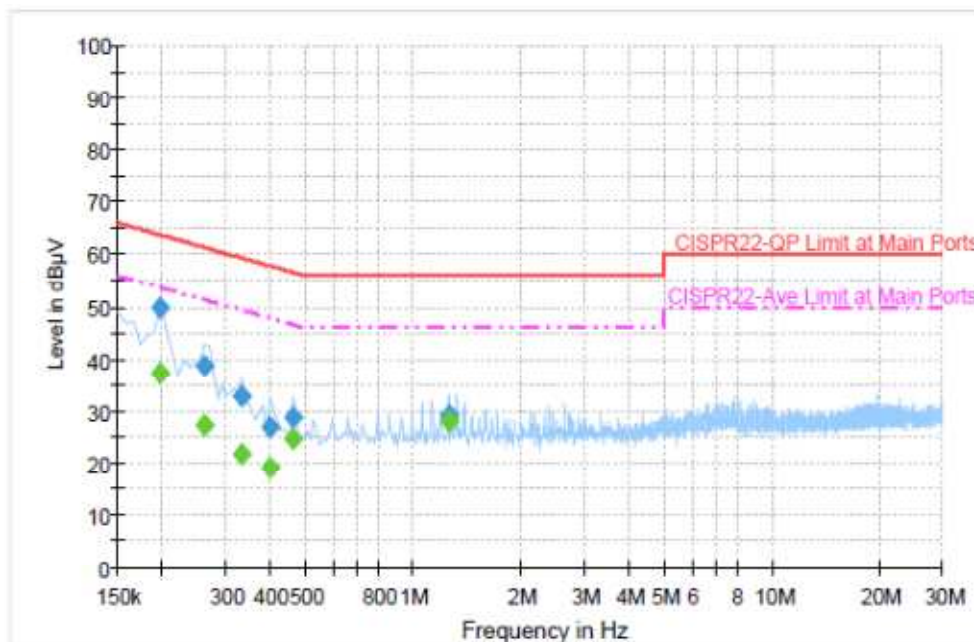
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	50.1	Off	L1	19.3	13.6	63.7
0.262000	39.0	Off	L1	19.4	22.4	61.4
0.334000	33.0	Off	L1	19.4	26.4	59.4
0.398000	29.7	Off	L1	19.5	28.2	57.9
0.462000	27.2	Off	L1	19.3	29.5	56.7
1.326000	28.6	Off	L1	19.5	27.4	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	37.0	Off	L1	19.3	16.7	53.7
0.262000	27.2	Off	L1	19.4	24.2	51.4
0.334000	21.5	Off	L1	19.4	27.9	49.4
0.398000	22.6	Off	L1	19.5	25.3	47.9
0.462000	23.0	Off	L1	19.3	23.7	46.7
1.326000	27.5	Off	L1	19.5	18.5	46.0

Test Mode :	Mode 1	Temperature :	20~21°C
Test Engineer :	Kyle Jhuang	Relative Humidity :	50~51%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	LTE Band 13 Idle + Charging from Notebook		
Remark :	All emissions not reported here are more than 10 dB below the prescribed limit.		



Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	50.0	Off	N	19.3	13.7	63.7
0.262000	38.9	Off	N	19.4	22.5	61.4
0.334000	33.0	Off	N	19.4	26.4	59.4
0.398000	27.0	Off	N	19.5	30.9	57.9
0.462000	28.9	Off	N	19.3	27.8	56.7
1.262000	29.2	Off	N	19.5	26.8	56.0

Final Result : Average

Frequency (MHz)	Average (dBµV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBµV)
0.198000	37.1	Off	N	19.3	16.6	53.7
0.262000	27.4	Off	N	19.4	24.0	51.4
0.334000	21.7	Off	N	19.4	27.7	49.4
0.398000	19.2	Off	N	19.5	28.7	47.9
0.462000	24.7	Off	N	19.3	22.0	46.7
1.262000	28.0	Off	N	19.5	18.0	46.0

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

3.2.2. Measuring Instruments

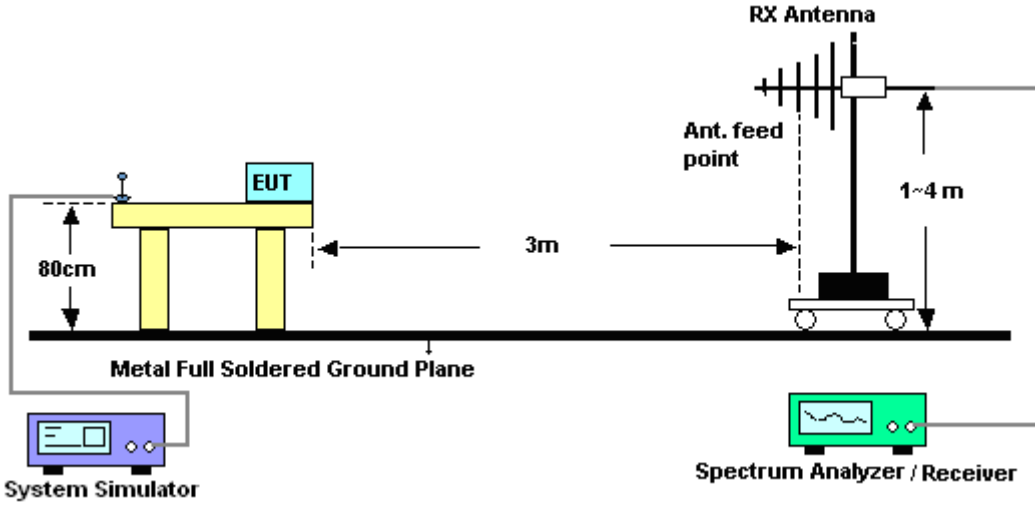
See list of measuring instruments of this test report.

3.2.3. Test Procedures

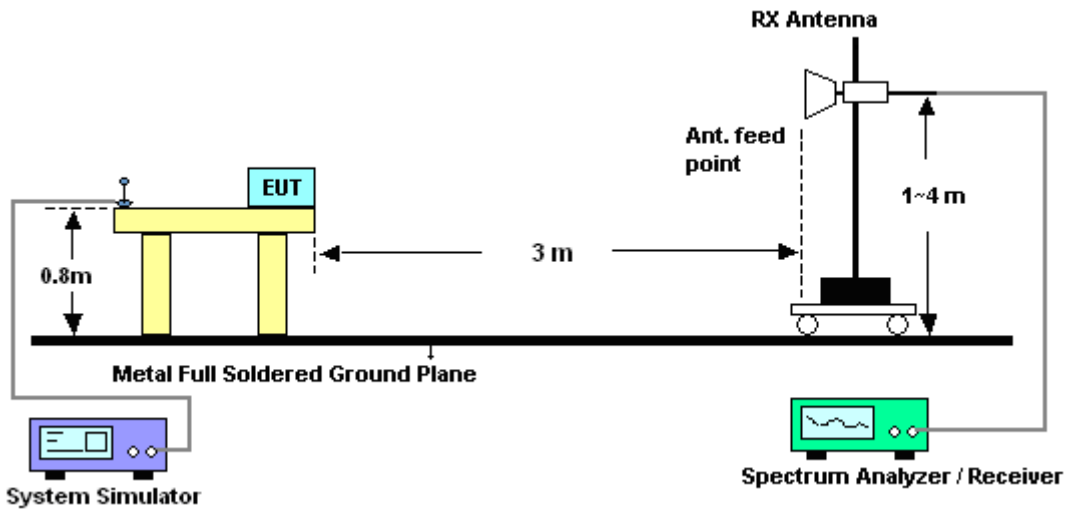
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna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

For radiated emissions from 30MHz to 1GHz



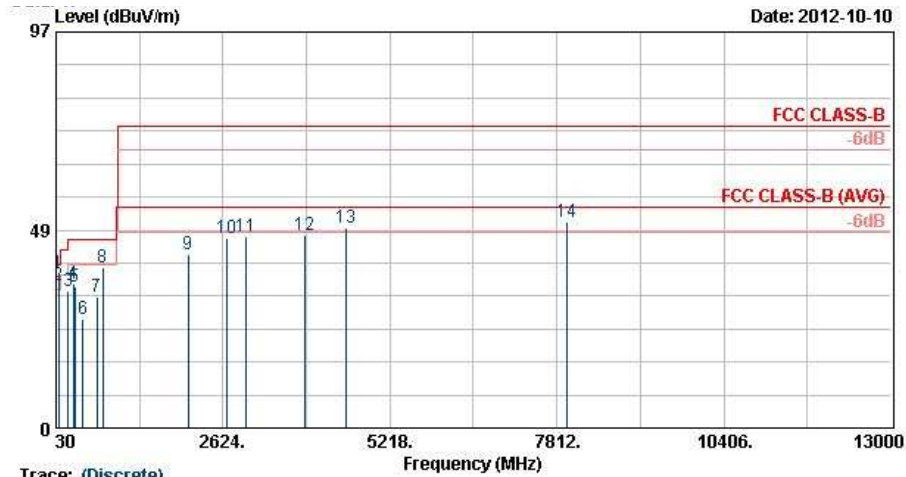
For radiated emissions above 1GHz





3.2.5. Test Result of Radiated Emission

Test Mode :	Mode 1	Temperature :	23~25°C
Test Engineer :	Timberland Lin	Relative Humidity :	50~51%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	LTE Band 13 Idle + Charging from Notebook		

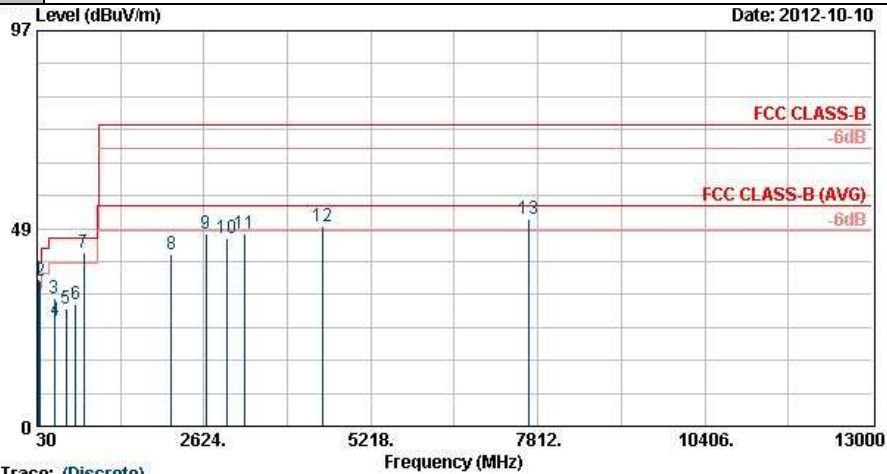


Trace: (Discrete)
 Site : 03CH06-HY
 Condition : FCC CLASS-B HF-ANT_120801 HORIZONTAL
 Power : From System
 Mode : Mode 1

	Freq	Level	Over	Limit	ReadAntenna	Cable Preamp	Ant	Table	
	MHz	dBUV/m	Limit	Line	Level Factor	Loss Factor	Pos	Pos	Remark
			dB	dBUV/m	dBuV	dB	cm	deg	
1 @	75.09	37.69	-2.31	40.00	61.49	6.60	200	360	Peak
2 !	75.09	35.10	-4.90	40.00	58.90	6.60	200	360	QP
3	215.49	33.66	-9.84	43.50	54.19	9.00	---	---	Peak
4	295.68	35.51	-10.49	46.00	51.96	13.12	---	---	Peak
5	323.80	34.49	-11.51	46.00	49.81	13.64	---	---	Peak
6	448.40	26.69	-19.31	46.00	38.72	16.76	---	---	Peak
7	663.30	31.96	-14.04	46.00	41.25	19.16	---	---	Peak
8	751.00	39.30	-6.70	46.00	47.37	19.87	---	---	Peak
9	2086.00	42.51	-31.49	74.00	58.57	31.92	---	---	Peak
10	2678.00	46.57	-27.43	74.00	60.81	32.72	---	---	Peak
11	2982.00	46.80	-27.20	74.00	60.13	33.08	---	---	Peak
12	3886.00	47.13	-26.87	74.00	59.50	33.66	---	---	Peak
13	4542.00	48.97	-25.03	74.00	58.97	34.99	---	---	Peak
14	7966.00	50.60	-23.40	74.00	59.24	36.10	100	105	Peak



Test Mode :	Mode 1	Temperature :	23~25°C
Test Engineer :	Timberland Lin	Relative Humidity :	50~51%
Test Distance :	3m	Polarization :	Vertical
Function Type :	LTE Band 13 Idle + Charging from Notebook		



Trace: (Discrete)

Site : 03CH06-HY
 Condition : FCC CLASS-B HF-ANT_120801 VERTICAL
 Power : From System
 Mode : Mode 1

	Freq	Level	Over	Limit	Read	Antenna	Cable	Preamp	Ant	Table	
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	Pos	Pos	Remark
			dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg	
1 !	53.49	36.17	-3.83	40.00	59.46	7.50	0.82	31.61	100	157	Peak
2 !	85.08	35.60	-4.40	40.00	58.20	7.70	1.02	31.32	---	---	Peak
3	299.73	31.26	-14.74	46.00	47.89	13.20	1.91	31.74	---	---	Peak
4	306.30	25.95	-20.05	46.00	42.09	13.39	1.93	31.47	---	---	Peak
5	479.90	28.87	-17.13	46.00	40.02	17.40	2.30	30.85	---	---	Peak
6	633.90	29.97	-16.03	46.00	39.31	19.20	2.79	31.34	---	---	Peak
7 @	751.00	42.63	-3.37	46.00	50.70	19.87	3.05	31.00	---	---	Peak
8	2118.00	42.17	-31.83	74.00	58.10	31.97	6.07	53.98	---	---	Peak
9	2660.00	47.22	-26.78	74.00	61.53	32.70	6.92	53.93	---	---	Peak
10	2988.00	46.21	-27.79	74.00	59.54	33.08	7.59	54.00	---	---	Peak
11	3252.00	47.33	-26.67	74.00	60.46	33.10	7.82	54.05	---	---	Peak
12	4470.00	49.13	-24.87	74.00	59.20	34.92	10.01	54.99	---	---	Peak
13	7660.00	50.90	-23.10	74.00	59.72	36.10	10.92	55.83	100	141	Peak



4. List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
EMI Test Receiver	R&S	ESCI 7	100724	9kHz~7GHz	Sep. 03, 2012	Nov. 28, 2012	Sep. 02, 2013	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100081	9KHz ~ 30MHz	Dec. 09, 2011	Nov. 28, 2012	Dec. 08, 2012	Conduction (CO05-HY)
Two-LISN	R&S	ENV216	11-100080	9KHz ~ 30MHz	Dec. 06, 2011	Nov. 28, 2012	Dec. 05, 2012	Conduction (CO05-HY)
AC Power Source	APC	APC-1000W	N/A	N/A	N/A	Nov. 28, 2012	N/A	Conduction (CO05-HY)
Spectrum Analyzer	Agilent	E4408B	MY44211030	9KHz ~ 26.5GHz	Nov. 23, 2011	Oct. 10, 2012	Nov. 22, 2012	Radiation (03CH06-HY)
Spectrum Analyzer	R&S	FSP30	101352	9KHz-30GHz	Nov. 03, 2011	Oct. 10, 2012	Nov. 02, 2012	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/003	20MHz ~ 1000MHz	May 04, 2012	Oct. 10, 2012	May. 03, 2013	Radiation (03CH06-HY)
Bilog Antenna	SCHAFFNER	CBL6112B	2885	30MHz ~ 2GHz	Oct. 22, 2011	Oct. 10, 2012	Oct. 21, 2012	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 01, 2012	Oct. 10, 2012	Jul. 31, 2013	Radiation (03CH06-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA917025 1	15GHz ~ 40GHz	Oct. 20, 2011	Oct. 10, 2012	Oct. 19, 2012	Radiation (03CH06-HY)
Preamplifier	Agilent	8449B	3008A01917	1GHz ~ 26.5GHz	Apr. 13, 2012	Oct. 10, 2012	Apr. 12, 2013	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9KHz ~ 1GHz	Apr. 11, 2012	Oct. 10, 2012	Apr. 10, 2013	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 21, 2012	Oct. 10, 2012	Jul. 20, 2013	Radiation (03CH06-HY)
Pre Amplifier	MITEQ	AMF-7D-0010 1800-30-10P	159087	1GHz~18GHz	Feb. 27, 2012	Oct. 10, 2012	Feb. 26, 2013	Radiation (03CH06-HY)
LTE Base Station	Anritsu	MT8820C	6201074414	N/A	Jan. 05, 2012	Oct. 10, 2012 ~ Nov. 28, 2012	Jan. 04, 2013	-



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

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	2.54
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Uncertainty of Radiated Emission Measurement (1 GHz ~ 40 GHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.72
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Appendix A. Photographs of EUT

Please refer to Sporton report number EP2O0222 as below.