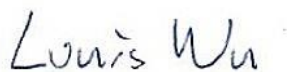


FCC Test Report

APPLICANT : Quanta Computer Inc.
EQUIPMENT : LTE M.2 Card
BRAND NAME : Quanta
MODEL NAME : LM175
MARKETING NAME : LM175
FCC ID : HFS-LM175
STANDARD : FCC 47 CFR FCC Part 15 Subpart B
CLASSIFICATION : Certification

The product was received on Jun. 06, 2014 and testing was completed on Jun. 18, 2014. We, SPORTON INTERNATIONAL INC., would like to declare that the tested sample has been evaluated in accordance with the test procedures given in ANSI C63.4-2009 and has been in 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: 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.



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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FC460690	Rev. 01	Initial issue of report	Jul. 17, 2014



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 7.30 dB at 0.158 MHz
3.2	15.109	ICES003 Section 6.2	Radiated Emission	< 15.109 limits < ICES003 6.2 limits	PASS	Under limit 6.71 dB at 192.540 MHz

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

1.3. Product Feature of Equipment Under Test

Product Feature	
Equipment	LTE M.2 CARD
Brand Name	Quanta
Model Name	LM175
Marketing Name	LM175
FCC ID	HFS-LM175
EUT supports Radios application	LTE
HW Version	LM175R5
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 subjective to this standard

Product Specification subjective to this standard	
Tx Frequency	LTE Band 4 : 1710.7 MHz ~ 1754.3 MHz LTE Band 13 : 779.5 MHz ~ 784.5 MHz
Rx Frequency	LTE Band 4 : 2110.7 MHz ~ 2154.3 MHz LTE Band 13 : 748.5 MHz ~ 753.5 MHz
Antenna Type	PIFA 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 Location

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code : 1190) and the FCC designation TW1022 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC Test.

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.	
	CO05-HY	03CH08-HY

1.7. Applicable 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 C63.4-2009

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 C63.4-2009 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 connected to notebook)	☒	☒	☒

Abbreviations:

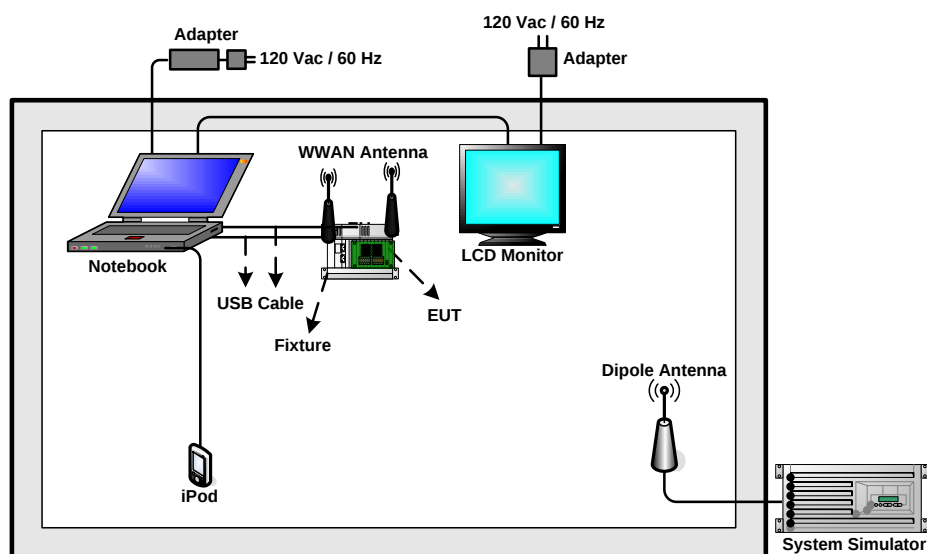
- EMI AC: AC conducted emissions
- EMI RE ≥ 1G: EUT radiated emissions ≥ 1GHz
- EMI RE < 1G: EUT radiated emissions < 1GHz

Test Items	EUT Configure Mode	Function Type
AC Conducted Emission	1	Mode 1: LTE Band 4 Idle + Charging from Notebook Mode 2: LTE Band 13 Idle + Charging from Notebook
Radiated Emissions < 1GHz	1	Mode 1: LTE Band 4 Idle + Charging from Notebook Mode 2: LTE Band 13 Idle + Charging from Notebook
Radiated Emissions ≥ 1GHz	1	Mode 1: LTE Band 13 Idle + Charging from Notebook

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 2; 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.	System Simulator	R&S	CMW 500	N/A	N/A	Unshielded, 1.8 m
2.	iPod	Apple	A1285	FCC DoC	Shielded, 1.0 m	N/A
3.	Notebook	DELL	Latitude E6320	FCC DoC/ Contains FCC ID: QDS-BRCM1054	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m
4.	LCD Monitor	DELL	U2410	FCC DoC	Shielded, 1.6 m	Unshielded, 1.8 m
5.	USB Cable	NA	N/A	N/A	Unshielded, 1.6m	NA
6.	Fixture	N/A	N/A	N/A	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 was 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.

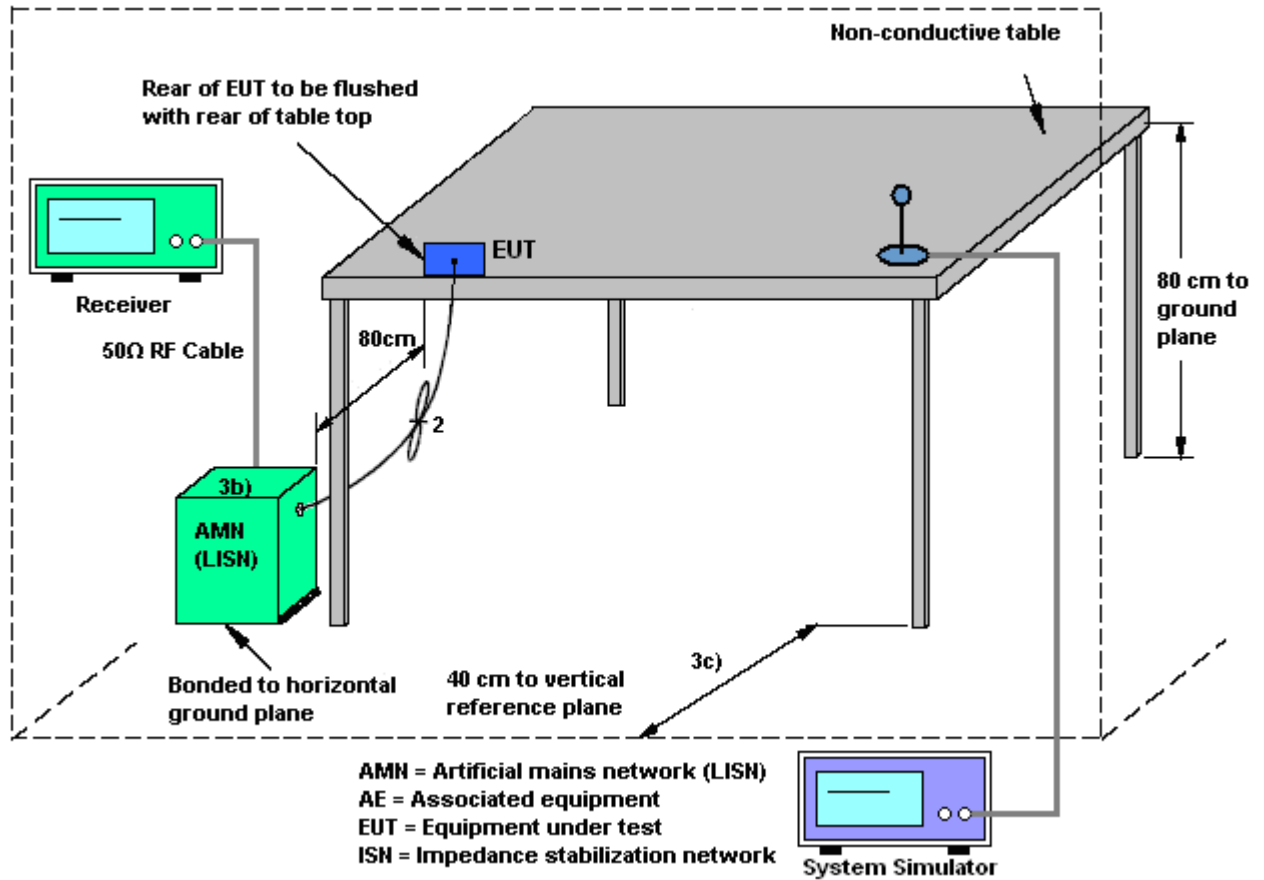
3.1.2 Measuring Instruments

The measuring equipment is listed in the section 4 of this test report.

3.1.3 Test Procedure

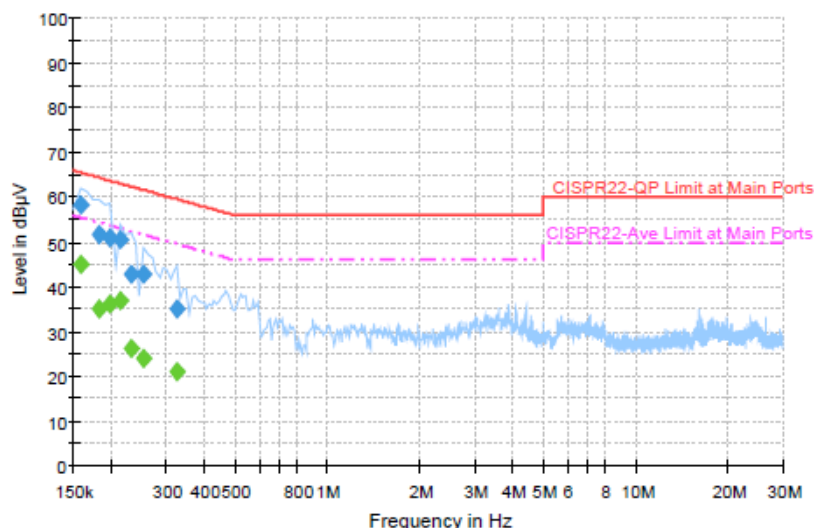
1. The EUT was placed 0.4 meter from the conducting wall of the shielding room was kept at least 80 centimeters from any other grounded conducting surface.
2. Connect EUT to the power mains through a line impedance stabilization network (LISN).
3. All the support units are connecting to the other LISN.
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 :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Line
Function Type :	LTE Band 4 Idle + Charging from Notebook		



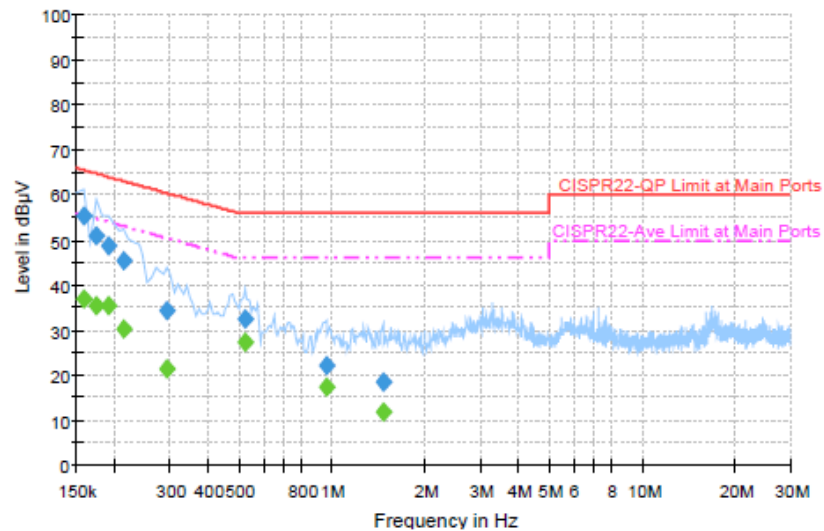
Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	58.3	Off	L1	19.3	7.3	65.6
0.182000	51.6	Off	L1	19.4	12.8	64.4
0.198000	51.0	Off	L1	19.3	12.7	63.7
0.214000	50.7	Off	L1	19.4	12.3	63.0
0.230000	42.8	Off	L1	19.4	19.6	62.4
0.254000	42.8	Off	L1	19.4	18.8	61.6
0.326000	35.1	Off	L1	19.4	24.5	59.6

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	45.0	Off	L1	19.3	10.6	55.6
0.182000	35.1	Off	L1	19.4	19.3	54.4
0.198000	36.0	Off	L1	19.3	17.7	53.7
0.214000	36.8	Off	L1	19.4	16.2	53.0
0.230000	26.3	Off	L1	19.4	26.1	52.4
0.254000	24.1	Off	L1	19.4	27.5	51.6
0.326000	20.9	Off	L1	19.4	28.7	49.6

Test Mode :	Mode 1	Temperature :	20~22℃
Test Engineer :	Cosmo Xu	Relative Humidity :	45~47%
Test Voltage :	120Vac / 60Hz	Phase :	Neutral
Function Type :	LTE Band 4 Idle + Charging from Notebook		


Final Result : Quasi-Peak

Frequency (MHz)	Quasi-Peak (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	55.3	Off	N	19.4	10.3	65.6
0.174000	51.1	Off	N	19.3	13.7	64.8
0.190000	48.8	Off	N	19.3	15.2	64.0
0.214000	45.5	Off	N	19.4	17.5	63.0
0.294000	34.2	Off	N	19.3	26.2	60.4
0.526000	32.5	Off	N	19.4	23.5	56.0
0.958000	22.3	Off	N	19.5	33.7	56.0
1.462000	18.3	Off	N	19.6	37.7	56.0

Final Result : Average

Frequency (MHz)	Average (dBμV)	Filter	Line	Corr. (dB)	Margin (dB)	Limit (dBμV)
0.158000	37.0	Off	N	19.4	18.6	55.6
0.174000	35.5	Off	N	19.3	19.3	54.8
0.190000	35.4	Off	N	19.3	18.6	54.0
0.214000	30.2	Off	N	19.4	22.8	53.0
0.294000	21.4	Off	N	19.3	29.0	50.4
0.526000	27.5	Off	N	19.4	18.5	46.0
0.958000	17.5	Off	N	19.5	28.5	46.0
1.462000	12.0	Off	N	19.6	34.0	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
Above 960	500	3

3.2.2. Measuring Instruments

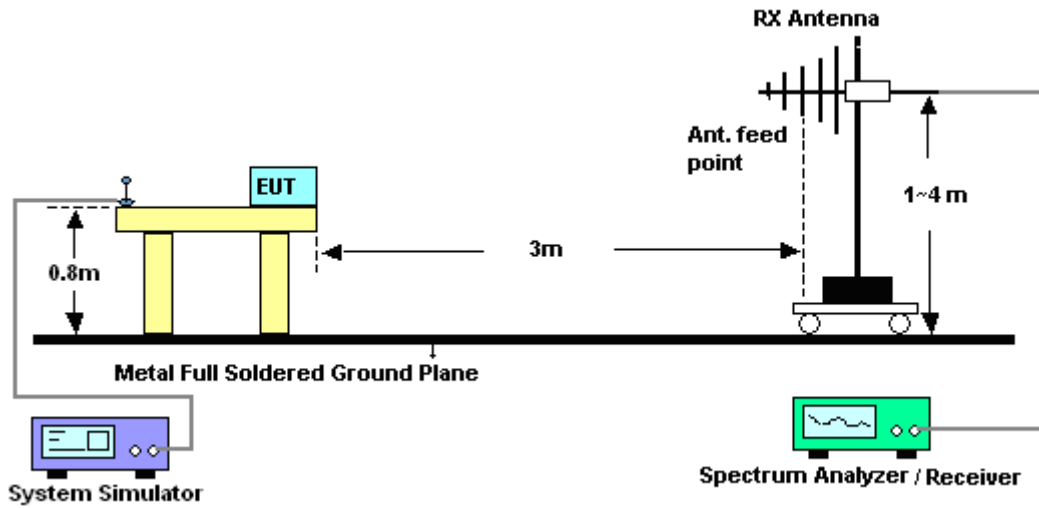
The measuring equipment is listed in the section 4 of this test report.

3.2.3. Test Procedures

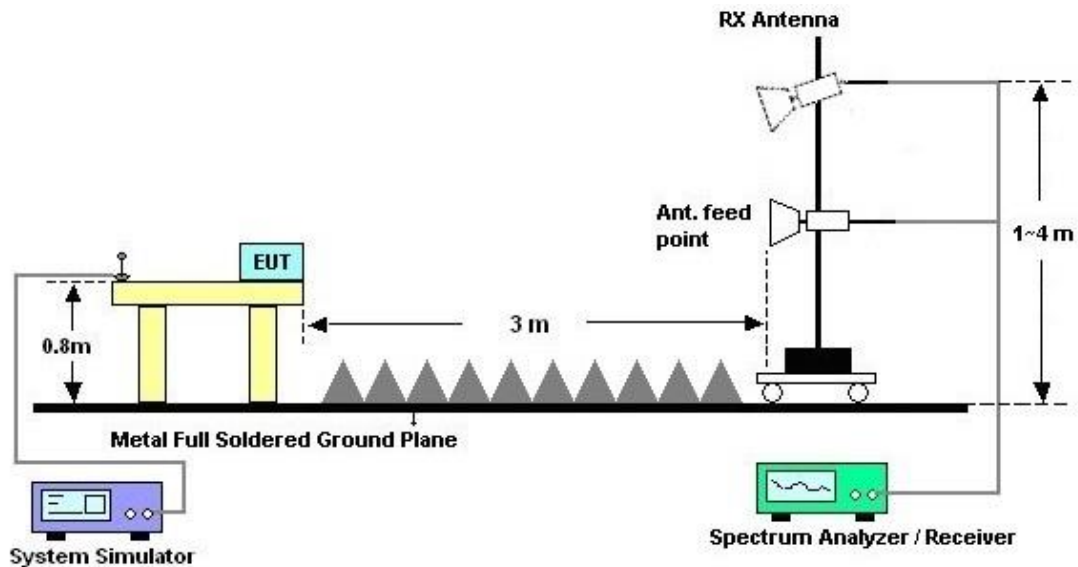
1. The EUT was placed on a turntable with 0.8 meter above ground.
2. The EUT was set 3 meters from the interference receiving antenna, which was mounted on the top of a variable height antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest radiation.
4. The antenna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

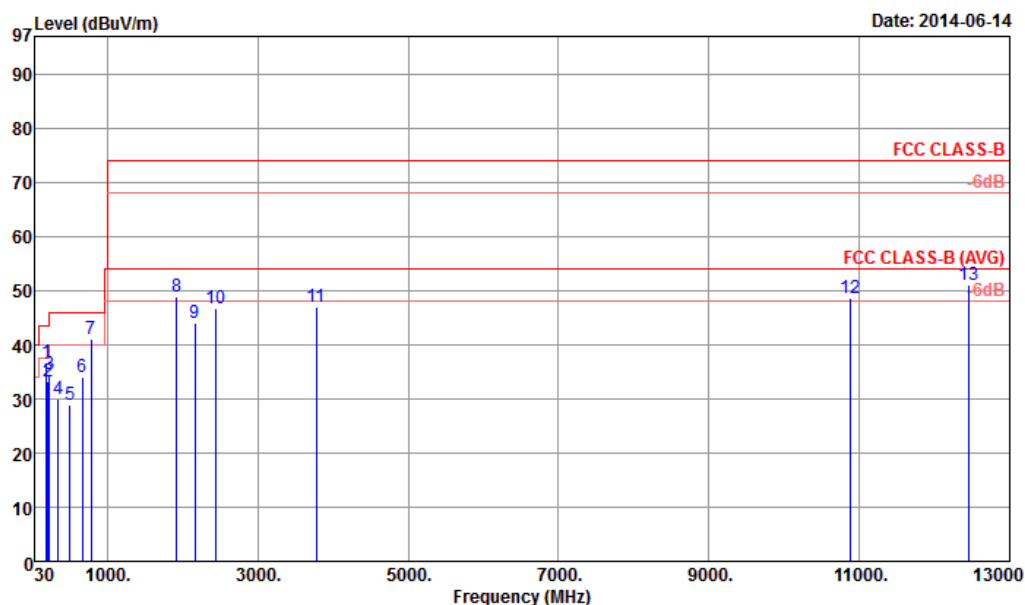


For radiated emissions above 1GHz



3.2.5. Test Result of Radiated Emission

Test Mode :	Mode 2	Temperature :	22~24°C
Test Engineer :	Luke Chang	Relative Humidity :	42~43%
Test Distance :	3m	Polarization :	Horizontal
Function Type :	LTE Band 13 Idle + Charging from Notebook		
Remark :	#7 is system simulator signal which can be ignored.		

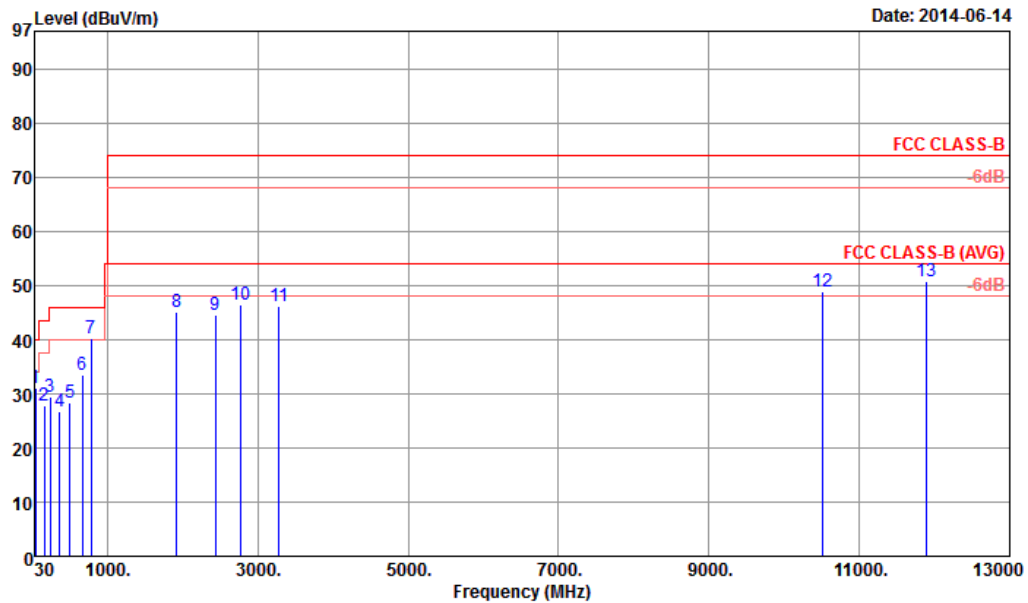


Site : 03CH08-HY
 Condition : FCC CLASS-B 3m HORN_9120D_H_130822 HORIZONTAL
 Power : From System
 Project : 460690
 Memo : Mode 2

	Freq	Level	Over Limit	Limit Line	ReadAntenna Level	Cable Loss	Preamp Factor	A/Pos	T/Pos	Remark
	MHz	dBuV/m	dB	dBuV/m	dBuV	dB/m	dB	dB	cm	deg
1	192.54	36.79	-6.71	43.50	57.17	9.44	1.93	31.75	100	214 Peak
2	213.33	33.22	-10.28	43.50	52.57	10.37	2.03	31.75	---	---
3	232.50	34.69	-11.31	46.00	53.00	11.31	2.12	31.74	---	---
4	341.30	29.91	-16.09	46.00	44.03	15.04	2.60	31.76	---	---
5	499.50	28.83	-17.17	46.00	39.31	18.28	3.17	31.93	---	---
6	666.80	34.17	-11.83	46.00	42.18	20.33	3.69	32.03	---	---
7 @	782.00	41.11			47.17	21.92	3.98	31.96	---	---
8	1922.00	48.97	-25.03	74.00	50.64	25.87	6.42	33.96	---	---
9	2166.00	44.03	-29.97	74.00	44.82	26.35	6.87	34.01	---	---
10	2436.00	46.80	-27.20	74.00	47.18	27.02	6.79	34.19	---	---
11	3774.00	47.05	-26.95	74.00	42.73	29.20	9.31	34.19	---	---
12	10880.00	48.66	-25.34	74.00	25.88	40.41	16.94	34.57	---	---
13	12450.00	50.94	-23.06	74.00	28.01	38.54	18.26	33.87	100	0 Peak



Test Mode :	Mode 2	Temperature :	22~24°C
Test Engineer :	Luke Chang	Relative Humidity :	42~43%
Test Distance :	3m	Polarization :	Vertical
Function Type :	LTE Band 13 Idle + Charging from Notebook		
Remark :	#7 is system simulator signal which can be ignored.		



Site : 03CH08-HY
 Condition : FCC CLASS-B 3m HORN_9120D_V_130822 VERTICAL
 Power : From System
 Project : 460690
 Memo : Mode 2

	Freq	Level	Over	Limit	ReadAntenna	Cable	Preamp	A/Pos	T/Pos	Remark
	MHz	dBuV/m	Limit	Line	Level	Factor	Loss	Factor	cm	deg
1	45.93	31.10	-8.90	40.00	50.46	11.48	0.94	31.78	125	221 Peak
2	164.73	27.86	-15.64	43.50	46.89	10.95	1.77	31.75	---	---
3	235.47	29.58	-16.42	46.00	47.67	11.52	2.13	31.74	---	---
4	365.10	26.66	-19.34	46.00	40.13	15.62	2.69	31.78	---	---
5	498.10	28.27	-17.73	46.00	38.78	18.26	3.16	31.93	---	---
6	664.00	33.54	-12.46	46.00	41.56	20.32	3.69	32.03	---	---
7 @	782.00	40.31			46.37	21.92	3.98	31.96	---	---
8	1922.00	45.07	-28.93	74.00	46.74	25.87	6.42	33.96	---	---
9	2434.00	44.63	-29.37	74.00	45.01	27.02	6.79	34.19	---	---
10	2770.00	46.43	-27.57	74.00	45.05	27.89	7.85	34.36	---	---
11	3284.00	46.28	-27.72	74.00	43.53	28.61	8.56	34.42	---	---
12	10504.00	48.79	-25.21	74.00	27.30	39.80	16.50	34.81	---	---
13	11892.00	50.76	-23.24	74.00	27.43	39.33	18.08	34.08	100	0 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. 15, 2013	Jun. 18, 2014	Nov. 14, 2014	Conduction (CO05-HY)
LISN (for auxiliary equipment)	Rohde & Schwarz	ENV216	100081	9kHz ~ 30MHz	Dec. 12, 2013	Jun. 18, 2014	Dec. 11, 2014	Conduction (CO05-HY)
LISN	Rohde & Schwarz	ENV216	100080	9kHz ~ 30MHz	Dec. 04, 2013	Jun. 18, 2014	Dec. 03, 2014	Conduction (CO05-HY)
AC Power Source	ChainTek	APC-1000W	N/A	N/A	N/A	Jun. 18, 2014	N/A	Conduction (CO05-HY)
EMI Test Receiver	Rohde & Schwarz	ESU26	100472	20Hz ~ 26.5GHz	Jan. 15, 2014	Jun. 14, 2014	Jan. 14, 2015	Radiation (03CH08-HY)
Bilog Antenna	Teseq GmbH	CBL6112D	35379	30MHz~2GHz	Oct. 10, 2013	Jun. 14, 2014	Oct. 09, 2014	Radiation (03CH08-HY)
Horn Antenna	SCHWARZBECK	BBHA 9120 D	9120D-1156	1GHz~18GHz	Aug. 22, 2013	Jun. 14, 2014	Aug. 21, 2014	Radiation (03CH08-HY)
SHF-EHF Horn Antenna	SCHWARZBECK	BBHA 9170	BBHA9170251	15GHz~40GHz	Oct. 03, 2013	Jun. 14, 2014	Oct. 02, 2014	Radiation (03CH08-HY)
Amplifier	SONOMA	310N	187231	9kHz~1GHz	May 12, 2014	Jun. 14, 2014	May 11, 2015	Radiation (03CH08-HY)
Preamplifier	MITEQ	AMF-7D-0010 1800-30-10P	1590074	1GHz~18GHz	Jul. 09, 2013	Jun. 14, 2014	Jul. 08, 2014	Radiation (03CH08-HY)
Pre Amplifier	Agilent	8449B	3008A02665	1GHz~26.5GHz	Sep. 04, 2013	Jun. 14, 2014	Sep. 03, 2014	Radiation (03CH08-HY)
Turn Table	Chaintek	Chaintek 3000	N/A	0~360 Degree	N/A	Jun. 14, 2014	N/A	Radiation (03CH08-HY)
Antenna Mast	MF	MFA520BS	N/A	1m~4m	N/A	Jun. 14, 2014	N/A	Radiation (03CH08-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
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Uncertainty of Radiated Emission Measurement (30 MHz ~ 1000 MHz)

Measuring Uncertainty for a Level of Confidence of 95% ($U = 2Uc(y)$)	4.30
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