Variant FCC RF Test Report

APPLICANT	:	QUANTA Computer Inc.
EQUIPMENT	:	LTE mPCIe-full-size module
BRAND NAME	:	Quanta; Aptos
MODEL NAME	:	LM172G/LM172
MARKETING NAME	:	LM172G/LM172
FCC ID	:	HFS-LI170
STANDARD	:	47 CFR Part 2, 27
CLASSIFICATION	:	PCS Licensed Transmitter (PCB)

This is a variant report which is only valid together with the original test report. The product was received on Oct. 28, 2013 and testing was completed on Nov. 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 / TIA / EIA-603-C-2004 and shown 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: Joseph Lin / Supervisor

Approved by: Jones Tsai / Manager

Testing Laboratory 1190

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG2O0222-05	Rev. 01	This is a variant report which can be referred product equality declaration. All the test cases were performed on original report which can be referred to Sporton Report Number FG2O0222 as appendix B. Based on the original report, only conducted output power and radiated spurious emission test items were verified.	Dec. 13, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	§2.1046	RSS-130(4.4)	Conducted Output Power	Reporting Only	PASS	-
3.2	§2.1053 §27.53(c)	RSS-130(4.6)	Radiated Spurious Emission	< $43+10\log_{10}$(P[Watts])	PASS	Under limit 27.38 dB at 2359.000 MHz

1 General Description

1.1 Applicant

QUANTA Computer Inc.
211, Wen Hua 2nd Rd., Kueishan, Taoyuan 33377, Taiwan

1.2 Manufacturer

QUANTA Computer Inc.
211, Wen Hua 2nd Rd., Kueishan, Taoyuan 33377, Taiwan

1.3 Feature of Equipment Under Test

Product Feature	
Equipment	LTE mPCIe-full-size module
Brand Name	Quanta; Aptos
Model Name	LM172G/LM172
Marketing Name	LM172G/LM172
FCC ID	HFS-LI170
Sample 1	Model Name: LM172G Marketing Name: LM172G EUT with GPS function
Sample 2	Model Name: LM172 Marketing Name: LM172 EUT without GPS function
EUT supports Radios application	LTE
HW Version	LM172G/LM172 R2
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	779.5 MHz ~ 784.5 MHz
Rx Frequency	748.5 MHz ~ 753.5 MHz
Bandwidth	5MHz / 10MHz
Maximum Output Power to Antenna	23.35 dBm / 0.22 W
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 Testing 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.**
	TH02-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:

- 47 CFR Part 2, 27
- ANSI / TIA / EIA-603-C-2004
- FCC KDB 971168 D01 Power Meas. License Digital Systems v02r01

Remark:

1. All test items were verified and recorded according to the standards and without any deviation during the test.
2. This EUT has also been tested and complied with the requirements of FCC Part 15, Subpart B, recorded in a separate test report.

2 Test Configuration of Equipment Under Test

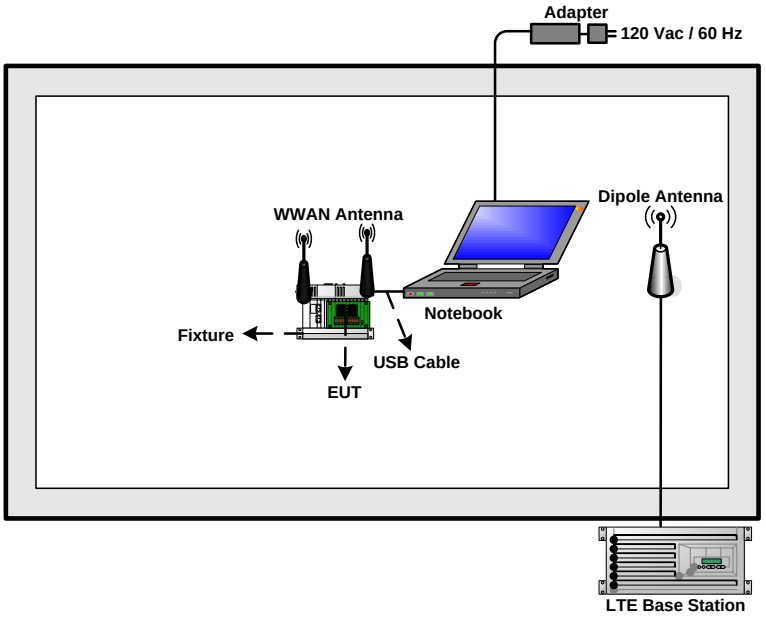
2.1 Test Mode

During all testing, EUT is in link mode with base station emulator at maximum power level. The spurious emission measurements were carried out in semi-anechoic chamber with 3-meter test range.

Frequency range investigated for radiated emission: 30MHz to 10th harmonic.

Test Modes		
Band		**Radiated TCs**
LTE Band 13	**BW 5MHz**	■ LTE (RB Size 1) Link
	BW 10MHz	-
Remark: The test was performed with Sample 1.		

2.2 Connection Diagram of Test System



2.3 Support Unit used in test configuration and system

Item	Equipment	Trade Name	Model No.	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.	Fixture	NA	NA	NA	NA	NA
4.	WWAN Antenna	NA	NA	NA	NA	NA
5.	USB Cable	NA	NA	NA	Shielded, 0.9 m	NA

3 Test Result

3.1 Conducted Output Power Measurement

3.1.1 Description of the Conducted Output Power Measurement

A base station simulator was used to establish communication with the EUT. Its parameters were set to transmit the maximum power on the EUT. The measured power in the radio frequency on the transmitter output terminals shall be reported.

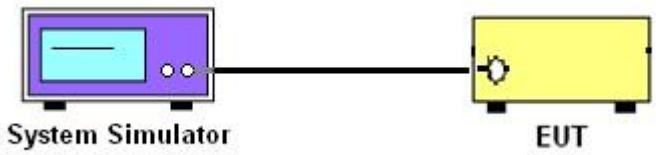
3.1.2 Measuring Instruments

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

3.1.3 Test Procedures

1. The transmitter output port was connected to base station.
2. Set EUT at maximum power through base station.
3. Select lowest, middle, and highest channels for each band and different modulation.

3.1.4 Test Setup



3.1.5 Test Result of Conducted Output Power

BW [MHz]	Modulation	RB Size	RB Offset	Power (dBm) Low Ch. / Freq.	Power (dBm) Middle Ch. / Freq.	Power (dBm) High Ch. / Freq.
Channel					**23230**	
Frequency (MHz)					**782**	
10	QPSK	1	0		22.62	
10	QPSK	1	49		22.58	
10	QPSK	25	13		22.37	
10	QPSK	50	0		22.59	
10	16QAM	1	0		23.09	
10	16QAM	1	49		22.77	
10	16QAM	25	13		22.53	
10	16QAM	50	0		22.87	
Channel				**23205**	**23230**	**23255**
Frequency (MHz)				**779.5**	**782**	**784.5**
5	QPSK	1	0	22.47	22.67	22.76
5	QPSK	1	24	22.81	22.56	23.04
5	QPSK	12	6	22.72	22.40	22.64
5	QPSK	25	0	22.54	22.49	22.61
5	QPSK	1	0	22.66	22.98	22.78
5	QPSK	1	24	22.98	22.81	**23.35**
5	QPSK	12	6	22.85	22.66	23.09
5	16QAM	25	0	22.67	22.84	22.68

3.2 Radiated Spurious Emission Measurement

3.2.1 Description of Radiated Spurious Emission

The radiated spurious emission was measured by substitution method according to ANSI / TIA / EIA-603-C-2004. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitter power (P) by a factor of at least 43 + 10 log (P) dB. The spectrum is scanned from 30 MHz up to a frequency including its 10th harmonic.

3.2.2 Measuring Instruments

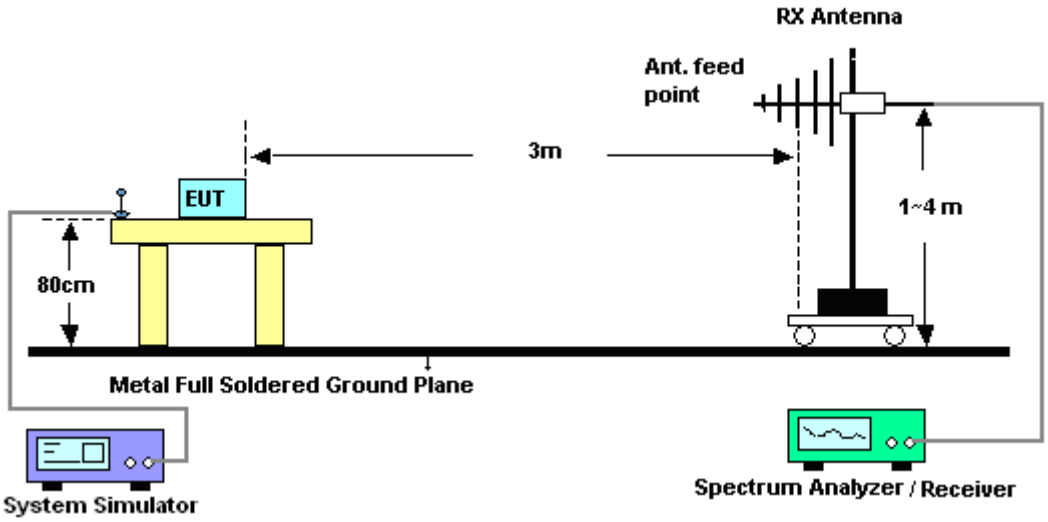
The measuring equipment is listed in the section 4 of this test report.

3.2.3 Test Procedures

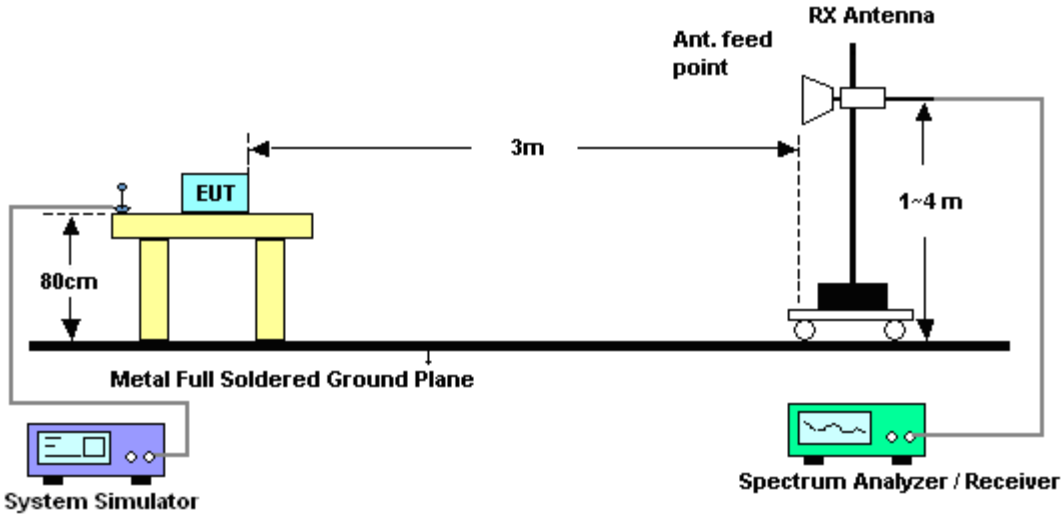
1. The EUT was placed on a rotatable wooden table with 0.8 meter above ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving antenna is varied between one meter and four meters to search the maximum spurious emission for both horizontal and vertical polarizations.
5. Make the measurement with the spectrum analyzer's RBW = 1MHz, VBW = 3MHz, taking the record of maximum spurious emission.
6. A horn antenna was substituted in place of the EUT and was driven by a signal generator.
7. Tune the output power of signal generator to the same emission level with EUT maximum spurious emission.
8. Taking the record of output power at antenna port.
9. Repeat step 7 to step 8 for another polarization.
10. The RF fundamental frequency should be excluded against the limit line in the operating frequency band.
    The limit line is derived from 43 + 10log(P)dB below the transmitter power P(Watts)
    = P(W)- [43 + 10log(P)] (dB)
    = [30 + 10log(P)] (dBm) - [43 + 10log(P)] (dB)
    = -13dBm.
11. EIRP (dBm) = S.G. Power – Tx Cable Loss + Tx Antenna Gain
12. ERP (dBm) = EIRP - 2.15

3.2.4 Test Setup

For radiated emissions from 30MHz to 1GHz

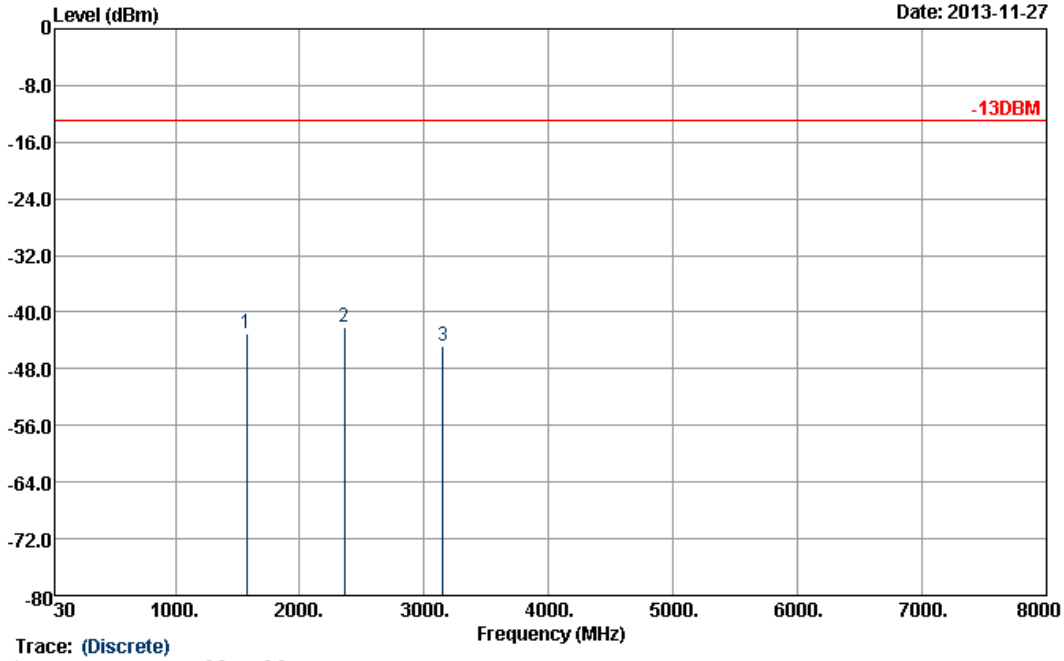


For radiated emissions above 1GHz



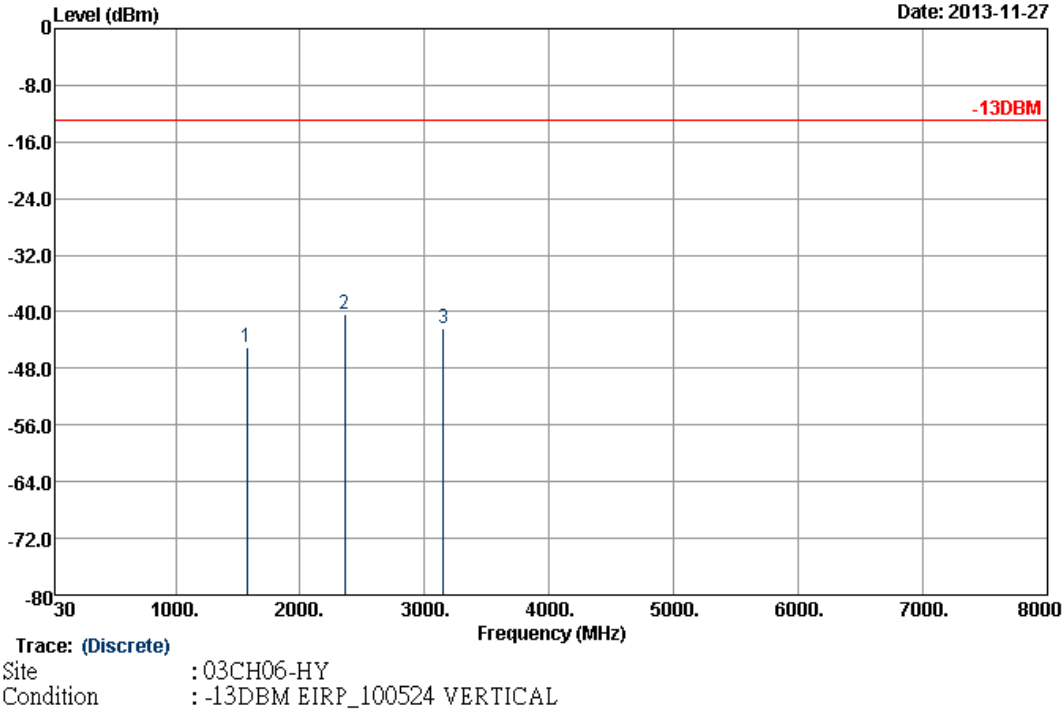
3.2.5 Test Result of Field Strength of Spurious Radiated

Band :	LTE Band 13	**Temperature :**	22~24°C
Test Mode :	5MHz QPSK RB Size 1 Offset 24	**Relative Humidity :**	47~49%
Channel :	23255	**Polarization :**	Horizontal
Test Engineer :	Marlboro Hsu		
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1573	-43.07	-13	-30.07	-53.24	-46.86	1.69	5.48	H	Pass
2359	-42.12	-13	-29.12	-54.9	-46.01	2.14	6.03	H	Pass
3148	-44.68	-13	-31.68	-60.27	-50.25	2.25	7.82	H	Pass

Band :	LTE Band 13	**Temperature :**	22~24°C
Test Mode :	5MHz QPSK RB Size 1 Offset 24	**Relative Humidity :**	47~49%
Channel :	23255	**Polarization :**	Vertical
Test Engineer :	Marlboro Hsu		
Remark :	Spurious emissions within 30-10th harmonic were found more than 20dB below limit line.		



Frequency (MHz)	ERP (dBm)	Limit (dBm)	Over Limit (dB)	SPA Reading (dBm)	S.G. Power (dBm)	TX Cable loss (dB)	TX Antenna Gain (dBi)	Polarization (H/V)	Result
1573	-44.95	-13	-31.95	-55.08	-48.74	1.69	5.48	V	Pass
2359	-40.38	-13	-27.38	-53.34	-44.27	2.14	6.03	V	Pass
3148	-42.36	-13	-29.36	-58.15	-47.93	2.25	7.82	V	Pass

4 List of Measuring Equipment

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
LTE Base Station	Anritsu	MT8820C	6201026480	30MHz~2.7GHz SISO (FDD Band 1~26)	Jan. 04, 2013	Nov. 14, 2013	Jan. 03, 2014	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	ESU26	100390	20Hz ~ 26.5GHz	Doc. 14, 2012	Nov. 27, 2013	Dec. 13, 2013	Radiation (03CH06-HY)
Spectrum Analyzer	Agilent	E4446A	MY50180136	3Hz~44GHz	Apr. 17, 2013	Nov. 27, 2013	Apr. 16, 2014	Radiation (03CH06-HY)
EMI Test Receiver	R&S	ESVS10	834468/0003	20MHz ~ 1000MHz	May 06, 2013	Nov. 27, 2013	May 05, 2014	Radiation (03CH06-HY)
Bilog Antenna	Schaffner	CBL6112B	2885	30MHz -2GHz	Oct. 10, 2013	Nov. 27, 2013	Oct. 09, 2014	Radiation (03CH06-HY)
Double Ridge Horn Antenna	EMCO	3117	00066583	1GHz ~ 18GHz	Aug. 02, 2013	Nov. 27, 2013	Aug. 01, 2014	Radiation (03CH06-HY)
Amplifier	Agilent	310N	186713	9kHz ~ 1GHz	Apr. 12, 2013	Nov. 27, 2013	Apr. 11, 2014	Radiation (03CH06-HY)
Pre Amplifier	EMCI	EMC051845	SN980048	1GHz ~ 18GHz	Jul. 18, 2013	Nov. 27, 2013	Jul. 17, 2014	Radiation (03CH06-HY)
Turn Table	INN-CO	DS2000	420/650/00	0 - 360 degree	N/A	Nov. 27, 2013	N/A	Radiation (03CH06-HY)
Antenna Mast	MF	MF-7802	MF780208212	1 m ~ 4 m	N/A	Nov. 27, 2013	N/A	Radiation (03CH06-HY)

5 Uncertainty of Evaluation

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

Measuring Uncertainty for a Level of Confidence of 95% (U = 2Uc(y))	**4.50**

Appendix B. Original Report

Please refer to Sporton report number FG2O0222 as below.