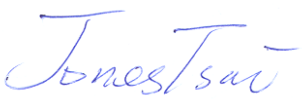
Variant FCC RF Test Report

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	:	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 Aug. 20, 2013 and completely tested on Aug. 30, 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 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: Joseph Lin / Supervisor



Approved by: Jones Tsai / Manager

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REVISION HISTORY

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FG2O0222-02	Rev. 01	This is a variant report for adding two PA sources, one DDR, one model name, and one marketing name. 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 radiated spurious emission was verified.	Oct. 23, 2013

SUMMARY OF TEST RESULT

Report Section	FCC Rule	IC Rule	Description	Limit	Result	Remark
3.1	§2.1046	RSS-139(6.4)	Conducted Output Power	Reporting Only	PASS	-
3.2	§2.1053 §27.53(c)	RSS-139 (6.5)	Radiated Spurious Emission	< 43+10log10(P[Watts])	PASS	Under limit 24.88 dB at 2341.000 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
3. **Topmore Technology Inc.**
   1F., No. 2, Liujia 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 Range	779.5 MHz ~784.5 MHz
Rx Frequency Range	748.5 MHz ~ 753.5 MHz
Bandwidth	5MHz / 10MHz
Maximum Output Power to Antenna	23.40 dBm
Antenna Type	Dipole Antenna
Antenna Gain	1.59 dBi
Type of Modulation	QPSK / 16QAM

1.5 Modification of EUT

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

1.6 Conducted Power

FCC Rule	System	Type of Modulation	BW	Conducted Power (dBm)
Part 27	LTE	QPSK	BW 5MHz	23.40
Part 27	LTE	16QAM	BW 5MHz	23.34
Part 27	LTE	QPSK	BW 10MHz	23.10
Part 27	LTE	16QAM	BW 10MHz	23.25

1.7 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.**
	03CH06-HY	722060/4086B-1

1.8 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

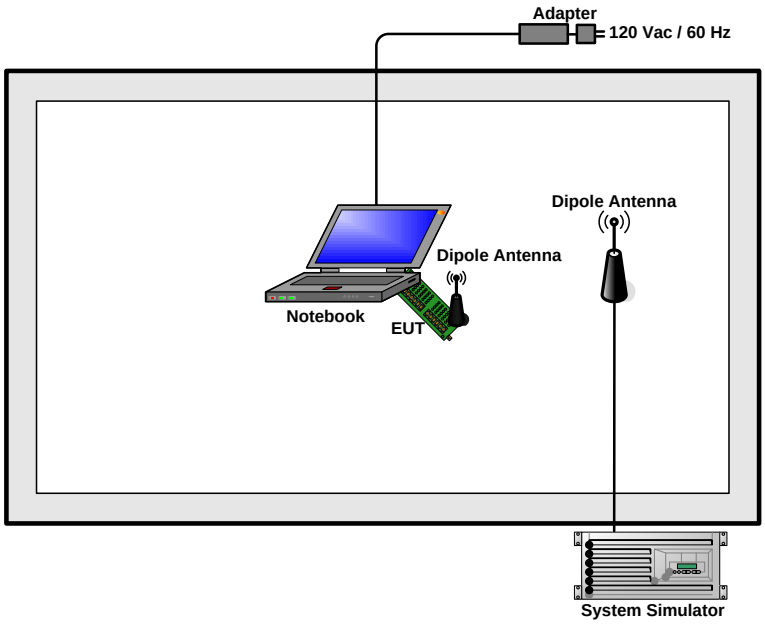
2.1 Test Mode

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
		Modulation : QPSK
LTE Band 13	BW 5MHz	■ LTE (RB Size 1) Link for Sample 1 ■ LTE (RB Size 1) Link for Sample 2 ■ LTE (RB Size 1) Link for Sample 3

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.	System Simulator	Anritsu	MT-8820C	N/A	N/A	Unshielded, 1.8 m
2.	Notebook	DELL	Vostro 1510	FCC DoC	N/A	AC I/P: Unshielded, 1.2 m DC O/P: Shielded, 1.8 m

2.4 Measurement Results Explanation Example

For all conducted test items:

The offset level is set in the spectrum analyzer to compensate the RF cable loss and attenuator factor between EUT conducted output port and spectrum analyzer. With the offset compensation, the spectrum analyzer reading level is exactly the EUT RF output level.

The spectrum analyzer offset is derived from RF cable loss and attenuator factor.

Offset = RF cable loss + attenuator factor.

Following shows an offset computation example with cable loss 4.2 dB and 10dB attenuator.

Example :

Offset(dB) = RF cable loss(dB) + attenuator factor(dB).

= 4.2 + 10 = 14.2 (dB)

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.

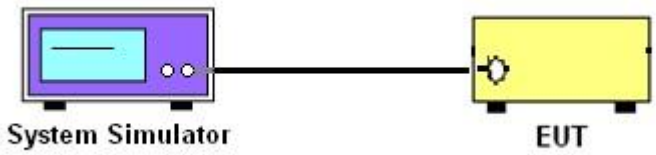
3.1.2 Measuring Instruments

See list of measuring instruments 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

<Sample 1>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel					**23230**	
Frequency (MHz)					**782**	
10	QPSK	1	0		23.09	
10	QPSK	1	24		22.88	
10	QPSK	1	49		23.07	
10	QPSK	25	0		23.08	
10	QPSK	25	12		22.76	
10	QPSK	25	24		22.94	
10	QPSK	50	0		22.91	
10	16QAM	1	0		23.25	
10	16QAM	1	24		23.17	
10	16QAM	1	49		23.00	
10	16QAM	25	0		23.22	
10	16QAM	25	12		23.14	
10	16QAM	25	24		23.12	
10	16QAM	50	0		23.11	
Channel				**23205**	**23230**	**23255**
Frequency (MHz)				**779.5**	**782**	**784.5**
5	QPSK	1	0	23.12	23.08	**23.27**
5	QPSK	1	12	23.07	22.87	22.93
5	QPSK	1	24	22.75	23.01	22.87
5	QPSK	12	0	22.74	23.03	23.14
5	QPSK	12	6	22.82	23.06	23.25
5	QPSK	12	11	22.80	23.07	22.70
5	QPSK	25	0	22.84	22.78	23.24
5	16QAM	1	0	23.03	23.27	23.21
5	16QAM	1	12	23.02	22.97	23.11
5	16QAM	1	24	22.88	23.09	22.97
5	16QAM	12	0	23.01	23.20	23.13
5	16QAM	12	6	22.83	23.26	23.02
5	16QAM	12	11	22.83	22.85	22.86
5	16QAM	25	0	22.97	23.25	23.11

<Sample 2>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel					23230	
Frequency (MHz)					782	
10	QPSK	1	0		23.10	
10	QPSK	1	24		22.69	
10	QPSK	1	49		22.90	
10	QPSK	25	0		22.64	
10	QPSK	25	12		22.57	
10	QPSK	25	24		22.67	
10	QPSK	50	0		22.90	
10	16QAM	1	0		23.10	
10	16QAM	1	24		22.99	
10	16QAM	1	49		22.91	
10	16QAM	25	0		22.80	
10	16QAM	25	12		22.87	
10	16QAM	25	24		23.04	
10	16QAM	50	0		23.06	
Channel				23205	23230	23255
Frequency (MHz)				779.5	782	784.5
5	QPSK	1	0	23.16	23.10	23.40
5	QPSK	1	12	22.82	22.73	22.86
5	QPSK	1	24	22.85	22.86	22.81
5	QPSK	12	0	22.82	22.92	22.96
5	QPSK	12	6	22.97	22.91	23.09
5	QPSK	12	11	22.95	22.95	22.63
5	QPSK	25	0	22.98	22.55	23.13
5	16QAM	1	0	23.14	23.12	23.34
5	16QAM	1	12	22.74	22.76	22.99
5	16QAM	1	24	22.69	22.94	22.78
5	16QAM	12	0	23.00	23.08	23.20
5	16QAM	12	6	23.07	23.10	23.17
5	16QAM	12	11	23.11	22.70	22.73
5	16QAM	25	0	23.10	22.98	23.24

<Sample 3>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.
Channel					**23230**	
Frequency (MHz)					**782**	
10	QPSK	1	0		23.08	
10	QPSK	1	24		22.81	
10	QPSK	1	49		23.01	
10	QPSK	25	0		22.96	
10	QPSK	25	12		22.64	
10	QPSK	25	24		23.02	
10	QPSK	50	0		22.86	
10	16QAM	1	0		23.23	
10	16QAM	1	24		22.97	
10	16QAM	1	49		22.80	
10	16QAM	25	0		23.21	
10	16QAM	25	12		23.03	
10	16QAM	25	24		23.14	
10	16QAM	50	0		23.07	
Channel				**23205**	**23230**	**23255**
Frequency (MHz)				**779.5**	**782**	**784.5**
5	QPSK	1	0	23.07	23.07	**23.37**
5	QPSK	1	12	23.04	22.76	22.92
5	QPSK	1	24	22.68	22.99	22.95
5	QPSK	12	0	22.74	22.84	23.21
5	QPSK	12	6	22.82	23.07	23.27
5	QPSK	12	11	22.84	23.05	22.78
5	QPSK	25	0	22.79	22.79	23.15
5	16QAM	1	0	23.10	23.19	23.31
5	16QAM	1	12	23.00	22.90	23.10
5	16QAM	1	24	22.82	22.93	22.95
5	16QAM	12	0	22.96	23.16	23.03
5	16QAM	12	6	22.93	23.12	23.07
5	16QAM	12	11	22.86	22.88	22.82
5	16QAM	25	0	22.97	23.05	23.21

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

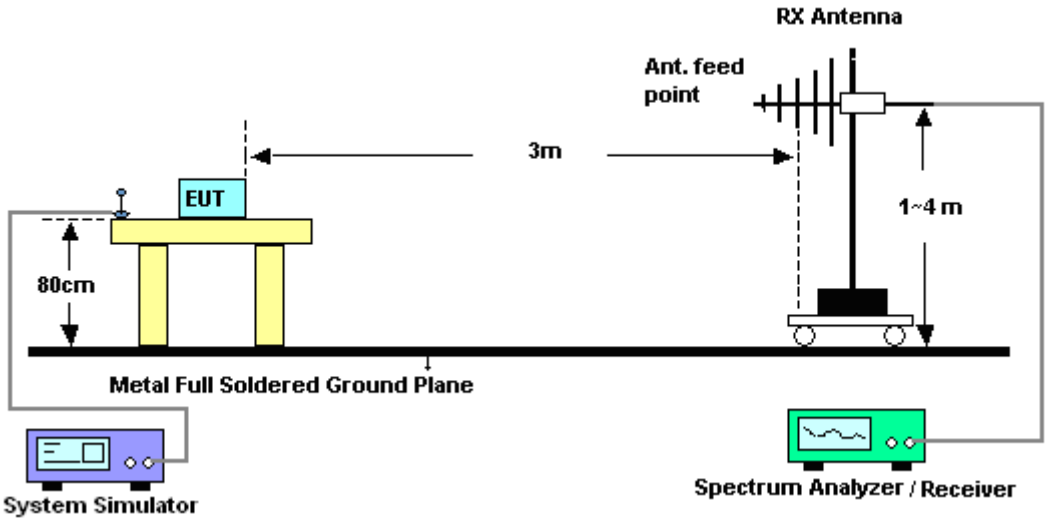
See list of measuring instruments of this test report.

3.2.3 Test Procedures

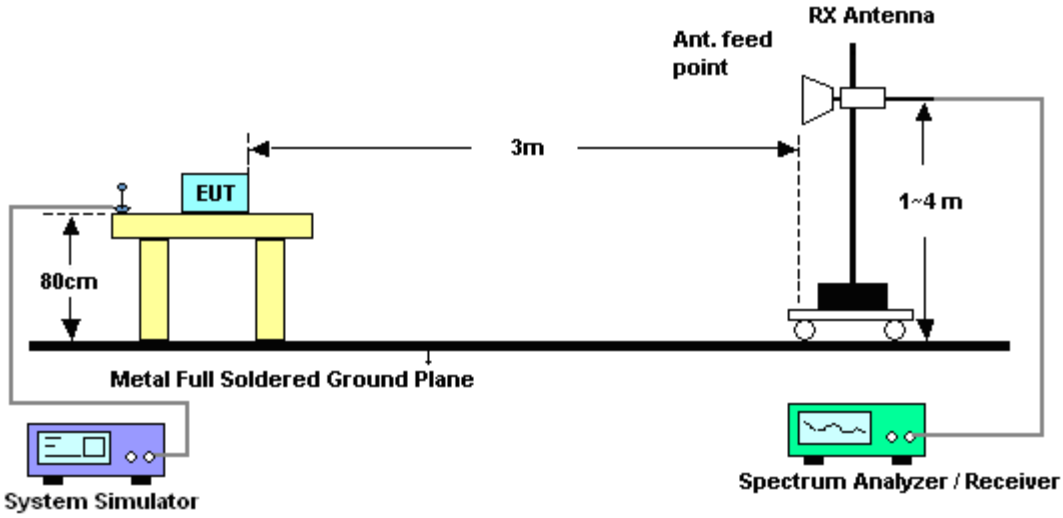
1. The EUT was placed on a rotatable wooden table with 0.8 meter about ground.
2. The EUT was set 3 meters from the receiving antenna, which was mounted on the antenna tower.
3. The table was rotated 360 degrees to determine the position of the highest spurious emission.
4. The height of the receiving 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, Sweep = 500ms, 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

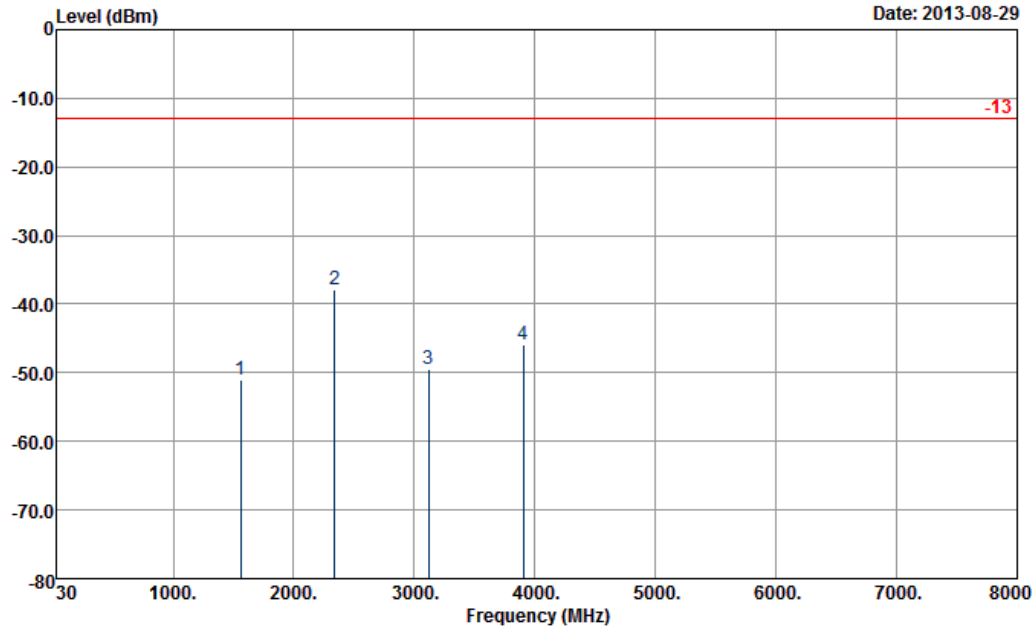


For radiated emissions above 1GHz



3.2.5 Test Result of Field Strength of Spurious Radiated

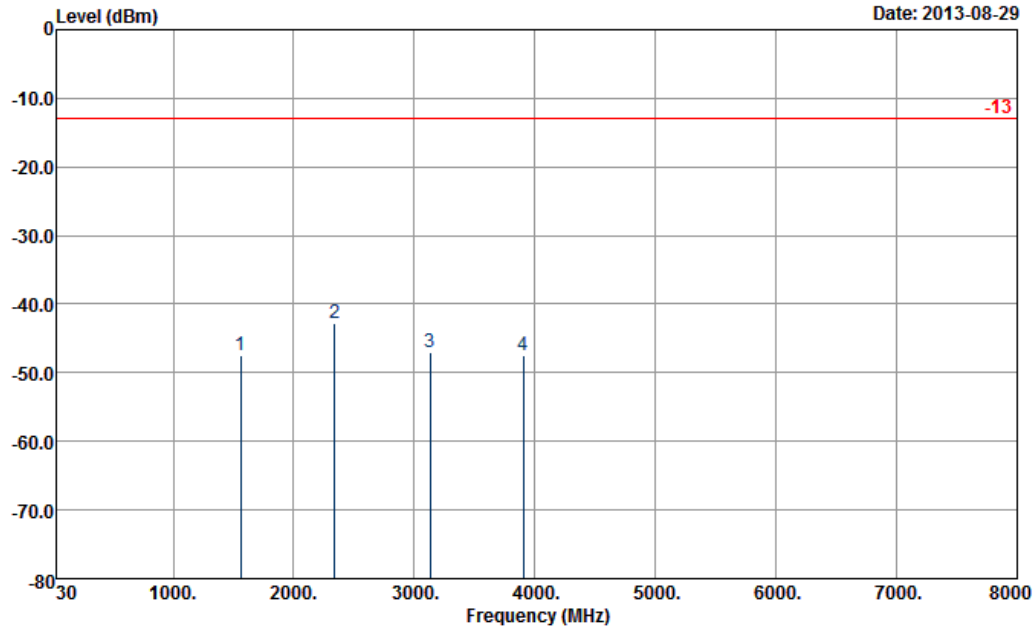
Band :	LTE Band 13	**Temperature :**	20~22°C
Test Mode :	5MHz, QPSK, RB Size 1 for Sample 1	**Relative Humidity :**	49~51%
Test Engineer :	Eric Shih	**Polarization :**	Horizontal
Remark :	Spurious emissions were found more than 20dB below limit line.		



Site : 03CH07-HY
Condition : -13 HF-EIRP(080306) HORIZONTAL

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
1558	-50.97	-13	-37.97	-58.51	-52.8	1.51	5.49	H	Pass
2341	-37.88	-13	-24.88	-49.55	-39.8	1.98	6.05	H	Pass
3121	-49.38	-13	-36.38	-62.62	-52.4	2.39	7.56	H	Pass
3901	-45.92	-13	-32.92	-61.12	-50.1	2.52	8.85	H	Pass

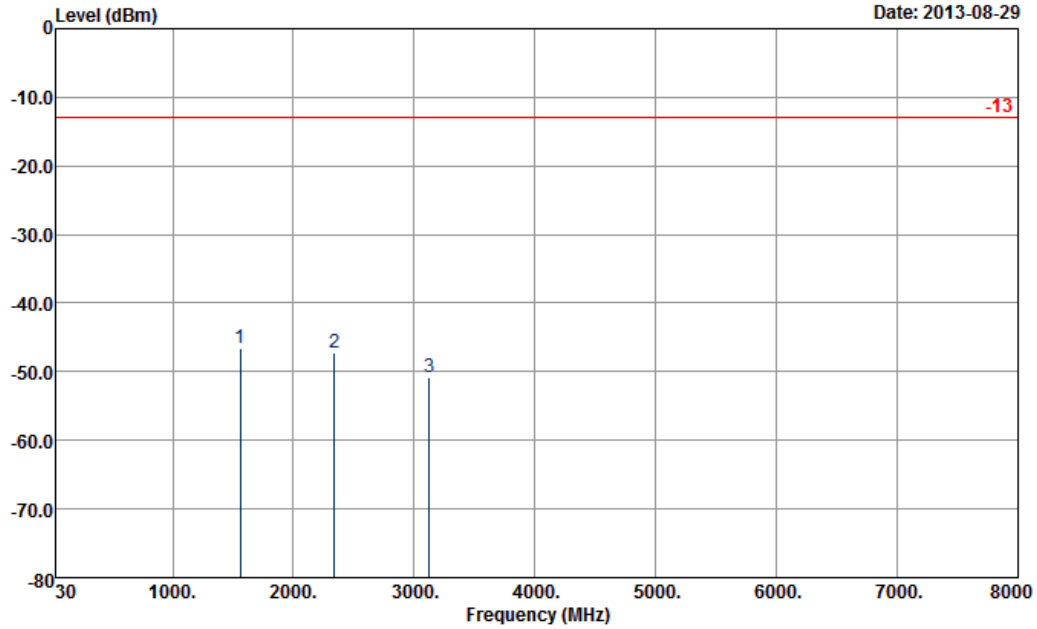
Band :	LTE Band 13	Temperature :	20~22°C
Test Mode :	5MHz, QPSK, RB Size 1 for Sample 1	Relative Humidity :	49~51%
Test Engineer :	Eric Shih	Polarization :	Vertical
Remark :	Spurious emissions were found more than 20dB below limit line.		



Site : 03CH07-HY
Condition : -13 HF-EIRP(080306) VERTICAL

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
1558	-47.37	-13	-34.37	-57.34	-49.2	1.51	5.49	V	Pass
2341	-42.88	-13	-29.88	-55.59	-44.8	1.98	6.05	V	Pass
3130	-47.08	-13	-34.08	-62.66	-50.1	2.39	7.56	V	Pass
3901	-47.42	-13	-34.42	-63.22	-51.6	2.52	8.85	V	Pass

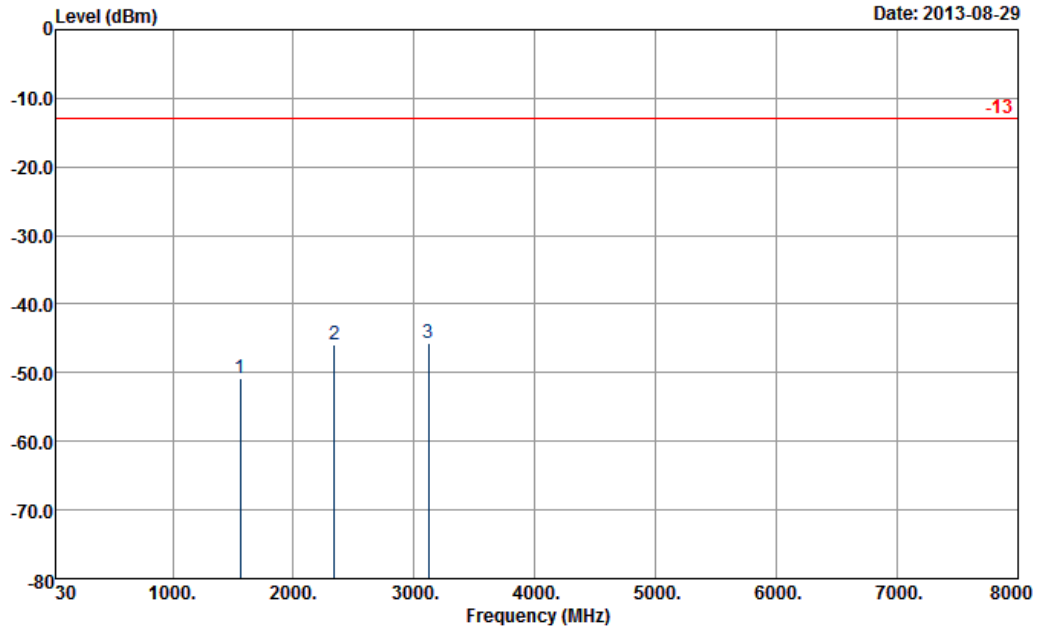
Band :	LTE Band 13	Temperature :	20~22°C
Test Mode :	5MHz, QPSK, RB Size 1 for Sample 2	Relative Humidity :	49~51%
Test Engineer :	Eric Shih	Polarization :	Horizontal
Remark :	Spurious emissions were found more than 20dB below limit line.		



Site : 03CH07-HY
Condition : -13 HF-EIRP(080306) HORIZONTAL

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
1558	-46.47	-13	-33.47	-54.25	-48.3	1.51	5.49	H	Pass
2341	-47.28	-13	-34.28	-59.29	-49.2	1.98	6.05	H	Pass
3124	-50.78	-13	-37.78	-63.82	-53.8	2.39	7.56	H	Pass

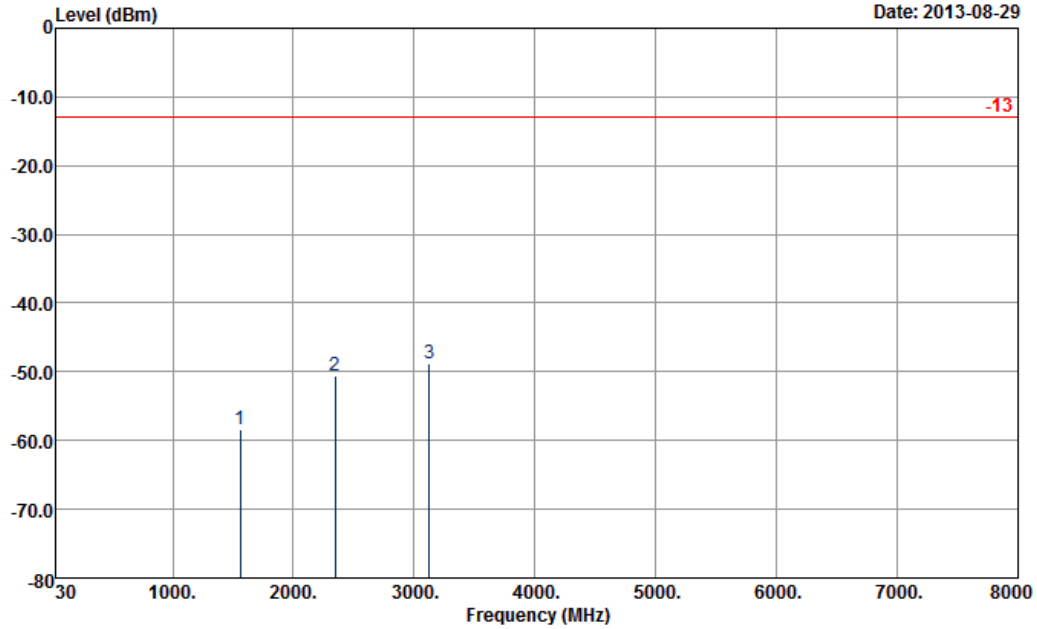
Band :	LTE Band 13	Temperature :	20~22°C
Test Mode :	5MHz, QPSK, RB Size 1 for Sample 2	Relative Humidity :	49~51%
Test Engineer :	Eric Shih	Polarization :	Vertical
Remark :	Spurious emissions were found more than 20dB below limit line.		



Site : 03CH07-HY
Condition : -13 HF-EIRP(080306) VERTICAL

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
1558	-50.77	-13	-37.77	-60.31	-52.6	1.51	5.49	V	Pass
2341	-45.88	-13	-32.88	-59.21	-47.8	1.98	6.05	V	Pass
3121	-45.78	-13	-32.78	-60.63	-48.8	2.39	7.56	V	Pass

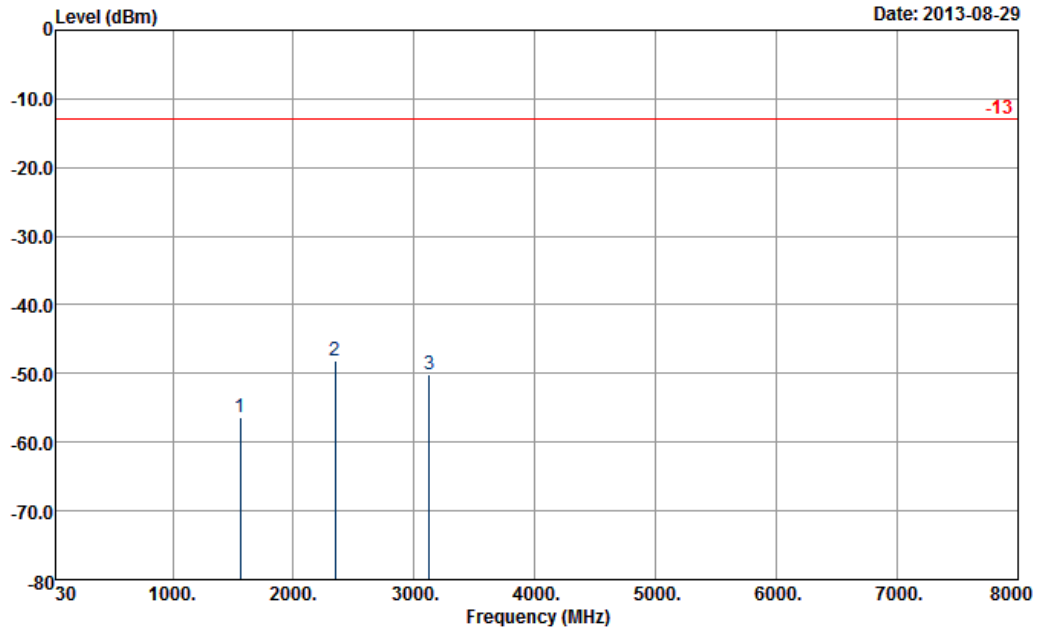
Band :	LTE Band 13	Temperature :	20~22°C
Test Mode :	5MHz, QPSK, RB Size 1 for Sample 3	Relative Humidity :	49~51%
Test Engineer :	Eric Shih	Polarization :	Horizontal
Remark :	Spurious emissions were found more than 20dB below limit line.		



Site : 03CH07-HY
Condition : -13 HF-EIRP(080306) HORIZONTAL

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
1561	-58.37	-13	-45.37	-65.82	-60.2	1.51	5.49	H	Pass
2344	-50.58	-13	-37.58	-62.44	-52.5	1.98	6.05	H	Pass
3124	-48.78	-13	-35.78	-61.69	-51.8	2.39	7.56	H	Pass

Band :	LTE Band 13	Temperature :	20~22°C
Test Mode :	5MHz, QPSK, RB Size 1 for Sample 3	Relative Humidity :	49~51%
Test Engineer :	Eric Shih	Polarization :	Vertical
Remark :	Spurious emissions 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
1562	-56.27	-13	-43.27	-65.94	-58.1	1.51	5.49	V	Pass
2344	-48.18	-13	-35.18	-61.06	-50.1	1.98	6.05	V	Pass
3124	-50.18	-13	-37.18	-65.14	-53.2	2.39	7.56	V	Pass

4 List of Measuring Equipments

Instrument	Manufacturer	Model No.	Serial No.	Characteristics	Calibration Date	Test Date	Due Date	Remark
System Simulator	Rohde & Schwarz	CMU200	117591	N/A	Oct. 21, 2011	Aug. 30, 2013	Oct. 20, 2013	Conducted (TH02-HY)
Spectrum Analyzer	Rohde & Schwarz	FSP30	101067	9kHz~30GHz	Nov. 30, 2012	Aug. 29, 2013	Nov. 29, 2013	Radiation (03CH07-HY)
Bilog Antenna	Schaffner	CBL6111C	2726	30MHz~1GHz	Oct. 06, 2012	Aug. 29, 2013	Oct. 05, 2013	Radiation (03CH07-HY)
Double Ridge Horn Antenna	ESCO	3117	75962	1GHz~18GHz	Aug. 22, 2013	Aug. 29, 2013	Aug. 21, 2014	Radiation (03CH07-HY)
Preamplifier	COM-POWER	PA-103A	161241	30MHz~1GHz	Feb. 26, 2013	Aug. 29, 2013	Feb. 25, 2014	Radiation (03CH07-HY)
Preamplifier	Agilent	8449B	3008A02362	1GHz~26.5GHz	Dec. 01, 2012	Aug. 29, 2013	Nov. 30, 2013	Radiation (03CH07-HY)
Turn Table	ChainTek	ChainTek 3000	N/A	0 ~ 360 degree	N/A	Aug. 29, 2013	N/A	Radiation (03CH07-HY)
Antenna Mast	ChainTek	ChainTek 3000	N/A	N/A	N/A	Aug. 29, 2013	N/A	Radiation (03CH07-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))	**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 FG2O0222 as below.