



RF Exposure Evaluation Report

APPLICANT : Quanta Computer Inc.
EQUIPMENT : LTE sip module
BRAND NAME : Quanta; Aptos; Topmore
MODEL NAME /
MARKETING NAME : LI170; S901100003
FCC ID : HFS-LI170
FILING TYPE : Certification
STANDARD : OET Bulletin 65 Supplement C (Edition 01-01)
KDB 447498 V05

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with FCC OET Bulletin 65 Supplement C (Edition 01-01) and KDB447498 V05 and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by:

Jones Tsai / Manager

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FCC ID : HFS-LI170

Page Number : 1 of 8

Report Issued Date : Nov. 28, 2012

Report Version : Rev. 02



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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA2O0222	Rev. 01	Initial issue of report	Nov. 08, 2012
FA2O0222	Rev. 02	Revise Section 4 and Section 5 and include KDB 447498 V05	Nov. 28, 2012

1. Administration Data

1.1. Testing Laboratory

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

1.2. Applicant

Company Name	Quanta Computer Inc.
Address	211 Wen Hwa 2nd Rd., Kueishan, Taoyuan 33377, Taiwan

1.3. Manufacturer

Company Name	1. Quanta Computer Inc. 2. Aptos Technology Inc. 3. Topmore Technology Inc.
Address	1. 211 Wen Hwa 2nd Rd., Kueishan, Taoyuan 33377, Taiwan 2. No. 398, Youyi Rd., Jhunan Township, Miaoli County 350, Taiwan 3. 1F., No. 2, Liujia 7th Rd., Zhubei City, Hsinchu County 302, Taiwan R.O.C.

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	LTE sip module
Brand Name	Quanta; Aptos; Topmore
Model Name / Marketing Name	LI170; S901100003
FCC ID	HFS-LI170
Tx Frequency	779.5 ~ 784.5 MHz
Antenna Type	Dipole Antenna
HW Version	LI170116
Uplink Modulation	QPSK, 16QAM
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.

3. RF Exposure Limit Introduction

The FCC categorizes the RF exposure limit based on the intended usage of the device and the user's awareness and ability to exercise control over his or her exposure. This is a consumer product to be used in the home, hence this device was evaluated by mobile device with general population/uncontrolled exposure condition. The definition of these category are shown as follows:

▪ **Mobile Devices:**

A mobile device is defined as a transmitting device designed to be used in other than fixed locations and to be generally used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitters' radiating structures and the body of the user or nearby persons. Transmitters designed to be used by consumers or workers that can be easily re-located are considered mobile devices if they meet the 20 centimeter separation requirement. The FCC rules for evaluating mobile devices for RF compliance are found in 47 CFR 2.1091.

▪ **General Population/Uncontrolled Exposure:**

The general population / uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity. Warning labels placed on low-power consumer devices such as cellular telephones are not considered sufficient to allow the device to be considered under the occupational/controlled category and the general population/uncontrolled exposure limits apply to these devices.

Per OET Bulletin 65, the power density limit for General Population/Uncontrolled Exposure summary here:

Table: Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Power Density (S) (mW/cm ²)
0.3–1.34	*(100)
1.34–30	*(180/f ²)
30–300	0.2
300–1500	f/1500
1500–100,000	1.0

f = frequency in MHz

* = Plane-wave equivalent power density

4. Conducted RF Output Power (Unit: dBm)

<LTE band 13 Conducted Power>

BW [MHz]	Mod / RB (Size - Offset)	Average Power. (dBm)			3GPP MPR	MPR Result (dB)		
		Low Ch	Mid Ch	High Ch		Low Ch	Mid Ch	High Ch
	Channel	-	23230	-		-	23230	-
	Frequency (MHz)	-	782	-		-	782	-
10	QPSK 1-0	-	23.06	-	0	-	0.00	-
10	QPSK 1-49	-	22.80	-		-	0.26	-
10	QPSK 25-13	-	22.69	-	≤ 1	-	0.37	-
10	QPSK 50-0	-	22.91	-		-	0.15	-
10	16QAM 1-0	-	23.39	-	≤ 1	-	-0.33	-
10	16QAM 1-49	-	23.11	-		-	-0.05	-
10	16QAM 25-13	-	22.93	-	≤ 2	-	0.13	-
10	16QAM 50-0	-	23.24	-		-	-0.18	-
	Channel	23205	23230	23255		23205	23230	23255
	Frequency (MHz)	779.5	782	784.5		779.5	782	784.5
5	QPSK 1-0	22.69	23.11	23.07	0	0.49	0.00	0.35
5	QPSK 1-24	23.18	22.95	23.42		0.00	0.16	0.00
5	QPSK 12-6	23.01	22.84	23.14	≤ 1	0.17	0.27	0.28
5	QPSK 25-0	22.80	22.92	22.92		0.38	0.19	0.50
5	16QAM 1-0	22.86	23.29	23.23	≤ 1	0.32	-0.18	0.19
5	16QAM 1-24	23.28	23.22	23.68		-0.10	-0.11	-0.26
5	16QAM 12-6	23.18	23.06	23.38	≤ 2	0.00	0.05	0.04
5	16QAM 25-0	23.05	23.18	23.16		0.13	-0.07	0.26

Modulation	RB size	Max Pwr.	Min Pwr.	Tune-up Limit Power	Max MPR	Min MPR	Avg MPR	Target MPR	3GPP MPR
QPSK	1 RB	23.42	22.69	24	0.49	0.00	0.11	0	0
16QAM	1 RB	23.68	22.86	24	0.32	-0.33	(0.04)	0	0~1

Note: The measured power of all RB configurations will never exceed the maximum tune-up power of 24dBm.

5. Radio Frequency Radiation Exposure Evaluation

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna (i.e., 20 cm for this product)

For this device, the calculation is as follows:

WWAN Operating frequency ≤ 1.5GHz

Function	Freq. (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Source-Based Time-Average Power (dBm)	Source-Based Time-Average Power (mW)	Source-Based Time-Average EIRP (mW)	Source-Based Time-Average ERP (mW)	Calculated RF Exposure (mW/cm ²)	Limit (mW/cm ²)
LTE Band 13	784.5	2.02	1.59	24	251.19	399.94	243.78	0.08	0.52

Conclusion:

Per part 2.1091(c), EUT source-based time-averaged ERP < 1.5W for RF operating frequency ≤ 1.5GHz, EUT source-based time-averaged EIRP < 3W for RF operating frequency > 1.5GHz, routine evaluation of MPE is not required; MPE calculation is sufficient to show compliance. The MPE calculation results indicate that the EUT complies with the RF exposure limit of FCC OET Bulletin 65 Supplement C (Edition 01-01) and KDB447498 V05