



RF Exposure Evaluation Report

APPLICANT : Quanta Computer Inc.
EQUIPMENT : LTE sip module
BRAND NAME : Quanta; Aptos; Topmore
MODEL NAME / : LI170; S901100003; S901100018
MARKETING NAME
FCC ID : HFS-LI170
STANDARD : 47 CFR Part 2.1091

We, SPORTON INTERNATIONAL INC., would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091, and pass the limit. Without written approval of SPORTON INTERNATIONAL INC., the test report shall not be reproduced except in full.

Reviewed by: Eric Huang / Deputy 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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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; S901100018
FCC ID	HFS-LI170
Wireless Technology and Frequency Range	LTE Band 13: 779.5 MHz ~ 784.5 MHz
Mode	• LTE: QPSK, 16QAM
Antenna Type	Dipole Antenna
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.



3. Maximum RF average output power among production units

LTE Band 13				
average power(dBm)				
Modulation	BW (MHz)	RB size	MPR (dB)	Target Power
QPSK	10	≤ 12	0	24
QPSK	10	> 12	1	23
16QAM	10	≤ 12	1	23
16QAM	10	> 12	2	22
QPSK	5	≤ 8	0	24
QPSK	5	> 8	1	23
16QAM	5	≤ 8	1	23
16QAM	5	> 8	2	22

The table below summarized necessary items addressed in KDB 941225 D05 v02.

FCC ID	HFS-LI170			
EUT	LTE sip module			
Operating Frequency Range of each LTE transmission band	LTE Band 13: 779.5 MHz ~ 784.5 MHz			
Channel Bandwidth	5MHz, 10MHz			
Transmission (H, M, L) channel numbers and frequencies in each LTE band				
Band 13				
	Bandwidth 5 MHz		Bandwidth 10 MHz	
	Channel #	Frequency (MHz)	Channel #	Frequency (MHz)
L	23205	779.5	23230	782
M	23230	782		
H	23255	784.5		

E category, uplink modulations used	Category 3, QPSK, and 16QAM							
LTE Voice / Data requirements	Data only							
LTE MPR permanently built-in by design	Yes, per 3GPP TS 36.101 v11.0.0							
	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 3							
	Modulation	Channel bandwidth / Transmission bandwidth (RB)						MPR (dB)
		1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	
QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	
16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	
16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2	
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing.							
Base station simulator used for Testing	Anritsu MT8820C							



4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500			f/1500	30
1500-100,000			1.0	30

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



5. Radio Frequency Radiation Exposure Evaluation

5.1. Power Density Calculations

<Standalone Calculated>

Note:

1. This MPE analysis is applicable to any collocated transmitters with transmit power for WLAN/WiMax is less than or equal to 29dBm and for Bluetooth is less than or equal to 15dBm.
2. A maximum antenna gain of 5 dBi for WLAN/WiMAX/BT has been assumed for all collocated antennas.
3. For conservativeness, the lowest uplink frequency of each band is used to determine the MPE limit of that band

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum ERP/EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
LTE Band 13	779.5	6.5	24.0	0.68	1122.02	0.22	0.52	0.43

<Collocate Calculated>

Note:

1. Σ (Power Density / Limit): This is a summation of [(power density for each transmitter/antenna included in the simultaneous transmission)/ (corresponding MPE limit)], for WWAN + WLAN + Bluetooth.
2. Considering the WWAN module collocation with the WLAN, WiMax and Bluetooth transmitter of the EIRP performance listed in the table above, the aggregated (power density /limit) is smaller than 1, and MPE of 3 collocated transmitters is compliant

Wireless Interface	EIRP (dBm)	Calculated Power Density (W/m ²)	Limit (W/m ²)	WLAN Power Density / Limit	Bluetooth Power Density / Limit	LTE Band 13 Power Density / Limit	Σ (Power Density / Limit) of WWAN+WLAN+Bluetooth
WLAN2.4GHz	34.0	0.50	1.0	0.50		0.43	0.95
WLAN5GHz	34.0	0.50	1.0	0.50			
WiMax	34.0	0.50	1.0	0.50			
Bluetooth	20.0	0.02	1.0		0.02		

Conclusion:

Based on 47 CFR §2.1091, the analysis concludes that this product when transmitting in standalone within a host device, is compliant with the FCC RF exposure requirements in mobile exposure condition, provided the conducted power and antenna gain do not exceed the limits for each given frequency band per wireless technology as follow table:

Technology	Band	Maximum Conducted Power (dBm)	Stanalone Maximum Antenna Gain (dBi)
LTE	Band 13	24.0	6.5