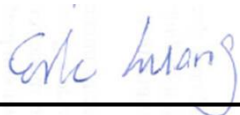


# RF Exposure Evaluation Report

**APPLICANT** : Advantech Co., Ltd.  
**EQUIPMENT** : Computer  
**BRAND NAME** : Advantech  
**MODEL NAME** : DLT-V4108xxxxxxxxxx (where "x" may be any alphanumeric character, "-" or blank.)  
**FCC ID** : M82-DLV4108  
**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 / Manager



Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)



## Table of Contents

<b>1. ADMINISTRATION DATA .....</b>	<b>4</b>
1.1. Testing Laboratory .....	4
<b>2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT) .....</b>	<b>5</b>
<b>3. MAXIMUM RF AVERAGE OUTPUT POWER AMONG PRODUCTION UNITS .....</b>	<b>6</b>
<b>4. RF EXPOSURE LIMIT INTRODUCTION .....</b>	<b>7</b>
<b>5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION .....</b>	<b>8</b>
5.1. Standalone Power Density Calculation .....	8
5.2. Collocated Power Density Calculation.....	9





**1. Administration Data**

**1.1. Testing Laboratory**

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	Advantech Co., Ltd.
Address	No.1, Alley 20, Lane 26, Rueiguang Rd., Neihu District, Taipei City, Taiwan, R.O.C.

Manufacturer	
Company Name	Advantech Co., Ltd.
Address	No.1, Alley 20, Lane 26, Rueiguang Rd., Neihu District, Taipei City, Taiwan, R.O.C.



**2. Description of Equipment Under Test (EUT)**

Product Feature & Specification	
EUT Type	Computer
Brand Name	Advantech
Model Name	DLT-V4108xxxxxxxx (where "x" may be any alphanumeric character, "-" or blank.)
FCC ID	M82-DLV4108
Integrated WWAN Module	Brand Name: Sierra Model Name: MC7354
Integrated WLAN Module	Brand Name: SparkLAN Model Name: WPEA-251N
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band IV: 1712.4 MHz ~ 1752.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz CDMA2000 BC0: 824.7 MHz ~ 848.31 MHz CDMA 2000 BC1: 1851.25 MHz ~ 1908.75 MHz CDMA 2000 BC10: 817.9 MHz ~ 823.1 MHz LTE Band 2: 1850 MHz ~ 1910 MHz LTE Band 4: 1710 MHz ~ 1755 MHz LTE Band 5: 824 MHz ~ 849 MHz LTE Band 13: 777 MHz ~ 787 MHz LTE Band 17: 704 MHz ~ 716 MHz LTE Band 25: 1850 MHz ~ 1915 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz
Mode	GPRS/EGPRS RMC 12.2Kbps HSDPA HSUPA DC-HSDPA CDMA2000 : 1xRTT/1xEv-Do(Rev.0)/1xEv-Do(Rev.A) LTE: QPSK, 16QAM 802.11a/b/g/n HT20/HT40 Bluetooth EDR/LE
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**

Mode	Burst average power(dBm)	
	GSM 900	GSM 1800
GPRS (GMSK, 1 Tx slot)	33.0	30.0
GPRS (GMSK, 2 Tx slots)	33.0	30.0
EDGE (8PSK, 1 Tx slot)	28.0	27.0
EDGE (8PSK, 2 Tx slots)	28.0	27.0
EDGE (8PSK, 3 Tx slots)	28.0	27.0
EDGE (8PSK, 4 Tx slots)	28.0	27.0

Mode		Average power(dBm)
WCDMA	Band II	24.0
	Band IV	24.0
	Band V	24.0
CDMA	BC0	24.5
	BC1	24.5
	BC10	24.5
LTE	B2	24.0
	B4	24.0
	B5	24.0
	B13	24.0
	B17	24.0
	B25	24.0

Mode		Maximum Average Power (dBm)
2.4GHz WLAN	802.11b	20.5
	802.11g	23.0
	802.11n-HT20	22.0
	802.11n-HT40	15.5
5GHz WLAN	802.11a	20.5
	802.11n-HT20	21.0
	802.11n-HT40	22.5
Bluetooth BR / EDR		1.0
Bluetooth LE		0.5



### 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 <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30-300	61.4	0.163	1.0	6
300-1500			f/300	6
1500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f <sup>2</sup> )	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. Standalone Power Density Calculation**

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Maximum EIRP (W)	Average EIRP (mW)	Power Density at 20cm (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Power Density / Limit
GPRS 850 (1 Tx slot)	824.2	3.04	33.00	36.040	4.018	505.825	0.101	0.549	0.183
GPRS 850 (2 Tx slots)	824.2	3.04	33.00	36.040	4.018	1009.253	0.201	0.549	0.366
EGPRS 850 (1 Tx slot)	824.2	3.04	28.00	31.040	1.271	159.956	0.032	0.549	0.058
EGPRS 850 (2 Tx slots)	824.2	3.04	28.00	31.040	1.271	319.154	0.064	0.549	0.116
EGPRS 850 (3 Tx slots)	824.2	3.04	28.00	31.040	1.271	476.431	0.095	0.549	0.173
EGPRS 850 (4 Tx slots)	824.2	3.04	28.00	31.040	1.271	636.796	0.127	0.549	0.231
GPRS 1900 (1 Tx slot)	1850.2	3.48	30.00	33.480	2.228	280.543	0.056	1.000	0.056
GPRS 1900 (2 Tx slots)	1850.2	3.48	30.00	33.480	2.228	559.758	0.111	1.000	0.111
EGPRS 1900 (1 Tx slot)	1850.2	3.48	27.00	30.480	1.117	140.605	0.028	1.000	0.028
EGPRS 1900 (2 Tx slots)	1850.2	3.48	27.00	30.480	1.117	280.543	0.056	1.000	0.056
EGPRS 1900 (3 Tx slots)	1850.2	3.48	27.00	30.480	1.117	418.794	0.083	1.000	0.083
EGPRS 1900 (4 Tx slots)	1850.2	3.48	27.00	30.480	1.117	559.758	0.111	1.000	0.111
WCDMA Band 2	1852.4	3.48	24.00	27.480	0.560	559.758	0.111	1.000	0.111
WCDMA Band 4	1712.4	3.48	24.00	27.480	0.560	559.758	0.111	1.000	0.111
WCDMA Band 5	826.4	3.04	24.00	27.040	0.506	505.825	0.101	0.551	0.183
CDMA2000 BC0	824.7	3.04	24.50	27.540	0.568	567.545	0.113	0.550	0.205
CDMA2000 BC1	1851.3	3.48	24.50	27.980	0.628	628.058	0.125	1.000	0.125
CDMA2000 BC10	817.9	3.04	24.50	27.540	0.568	567.545	0.113	0.545	0.207
LTE Band 2	1850.7	3.48	24.00	27.480	0.560	559.758	0.111	1.000	0.111
LTE Band 4	1710.7	3.48	24.00	27.480	0.560	559.758	0.111	1.000	0.111
LTE Band 5	824.7	3.04	24.00	27.040	0.506	505.825	0.101	0.550	0.183
LTE Band 13	779.5	3.04	24.00	27.040	0.506	505.825	0.101	0.520	0.194
LTE Band 17	706.5	3.04	24.00	27.040	0.506	505.825	0.101	0.471	0.214
LTE Band 25	1850.7	3.48	24.00	27.480	0.560	559.758	0.111	1.000	0.111
Bluetooth	2402.0	5.50	1.00	6.500	0.004	4.467	0.001	1.000	0.001
2.4GHz WLAN	2412.0	5.50	23.00	28.500	0.708	707.946	0.141	1.000	0.141
5GHz WLAN	5180.0	6.50	22.50	29.000	0.794	794.328	0.158	1.000	0.158

**Note:** For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.





**5.2. Collocated Power Density Calculation**

WLAN Power Density / Limit	Bluetooth Power Density / Limit	WWAN Power Density / Limit	$\Sigma$ (Power Density / Limit) of WWAN+WLAN+Bluetooth
0.158	0.001	0.366	0.525

**Note:**

1.  $\Sigma$  (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 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

**Conclusion:**

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.