IEEE C95.1 2005
KDB 447498 D03
47 C.F.R. Part 1, Subpart I, Section 1.1310
47 C.F.R. Part 2, Subpart J, Section 2.1091

RF EXPOSURE REPORT

For

Computer

Model:
TREK-530

Trade Name: ADVANTECH

Issued to

Advantech Co.Ltd.
No.1, Alley 20, Lane 26, Rueiguang Road, Neihu District, Taipei 114, Taiwan, R.O.C.

Issued by

Compliance Certification Services Inc.
No.11, Wugong 6th Rd., Wugu Dist.,
New Taipei City 24891, Taiwan. (R.O.C.)
http://www.ccsrf.com
Issued Date: June 21, 2018

Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	June 21, 2018	Initial Issue	ALL	Allison Chen
01	August 16, 2018	1. Revised antenna type. 2. Revised max tune up power. 3. Revised maximum permissible exposure. 4. Revised simultaneous transmission sar analysis.	P.6-7, 9-11	Allison Chen
02	August 24, 2018	1. Revised LTE band 17 data.	P.7, P.10	Allison Chen

TABLE OF CONTENTS

1. TEST RESULT CERTIFICATION

We hereby certify that:

The above equipment was tested by Compliance Certification Services Inc. The test data, data evaluation, test procedures, and equipment configurations shown in this report were made in accordance with the procedures given in ANSI C63.10: 2013 and the energy emitted by the sample EUT tested as described in this report is in compliance with the requirements of FCC Rules Part 15.207, 15.209, 15.247.

The test results of this report relate only to the tested sample EUT identified in this report.

APPLICABLE STANDARDS	
STANDARD	**TEST RESULT**
IEEE C95.1 2005 KDB 447498 D03 47 C.F.R. Part 1, Subpart I, Section 1.1310 47 C.F.R. Part 2, Subpart J, Section 2.1091	No non-compliance noted

Approved by:

Sam Chuang
Manager
Compliance Certification Services Inc.

Reporter:

Allison Chen
Report coordinator
Compliance Certification Services Inc.

2. LIMIT

According to §15.247(i), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy levels in excess of the Commission's guidelines. See § 1.1307(b)(1) of this chapter.

3. EUT SPECIFICATION

EUT	Computer
Model	TREK-530
Trade Name	ADVANTECH
Frequency band (Operating)	☒ GPRS / EGPRS 850MHz: 824.2MHz ~ 848.8MHz ☒ GPRS / EGPRS 1900MHz: 1850.2MHz ~ 1909.8MHz ☒ WCDMA Band II: 1852.4MHz ~ 1907.6MHz ☒ WCDMA Band V: 826.4MHz ~ 846.6MHz ☒ WCDMA Band IV: 1712.4MHz ~ 1752.6MHz ☒ LTE Band 2: 1850MHz ~ 1910MHz ☒ LTE Band 4: 1710MHz ~ 1755MHz ☒ LTE Band 5: 824MHz ~ 849MHz ☒ LTE Band 13: 777 MHz ~ 787 MHz ☒ LTE Band 17: 704 MHz ~ 716 MHz ☒ LTE Band 25: 1850 MHz ~ 1915MHz ☒ Bluetooth: 2402MHz ~ 2480MHz ☒ 802.11b/g/n HT20: 2412MHz ~ 2462MHz 802.11n HT40: 2422MHz ~ 2452MHz 802.11a/n HT20: 5180MHz ~ 5700MHz / 5745MHz ~ 5825MHz 802.11n HT40: 5190MHz ~ 5670MHz / 5755MHz ~ 5795MHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm^2) ☒ General Population/Uncontrolled exposure (S=1mW/cm^2)

Antenna Specification	**For WWAN** WCDMA Band II: -0.40 dBi (Numeric gain: 0.91) WCDMA Band IV: 0.90 dBi (Numeric gain: 1.23) WCDMA Band V: 0.50 dBi (Numeric gain: 1.12) LTE Band 2: 1.20 dBi (Numeric gain: 1.32) LTE Band 4: 1.80 dBi (Numeric gain: 1.51) LTE Band 5: -0.10 dBi (Numeric gain: 0.98) LTE Band 13: 1.00 dBi (Numeric gain: 1.26) LTE Band 17: 1.00 dBi (Numeric gain: 1.26) LTE Band 25: 1.20 dBi (Numeric gain: 1.32) GPRS / EGPRS 850MHz -1.80 dBi (Numeric gain: 0.66) GPRS / EGPRS 1900MHz 1.20 dBi (Numeric gain: 1.32) Type: Dipole Antenna **For WIFI (2.4GHz / 5GHz)** 2.4 GHz -0.61 dBi (Numeric gain: 0.87) 5 GHz -2.51 dBi (Numeric gain: 0.56) Type: Dipole Antenna **For Bluetooth** Bluetooth -0.61 dBi (Numeric gain: 0.87) Type: Dipole Antenna

Max tune up Power

System	Max Tune up Power	
WWAN		
GPRS 850	33.00 dBm	(1995.262 mW)
EGPRS 850	27.00 dBm	(501.187 mW)
GPRS 1900	30.00 dBm	(1000.000 mW)
EGPRS 1900	26.00 dBm	(398.107 mW)
WCDMA Band II:	24.00 dBm	(251.189 mW)
WCDMA Band IV:	24.00 dBm	(251.189 mW)
WCDMA Band V:	24.00 dBm	(251.189 mW)
LTE Band 2:	24.00 dBm	(251.189 mW)
LTE Band 4:	24.00 dBm	(251.189 mW)
LTE Band 5:	24.00 dBm	(251.189 mW)
LTE Band 13:	24.00 dBm	(251.189 mW)
LTE Band 17:	24.00 dBm	(251.189 mW)
LTE Band 25:	24.00 dBm	(251.189 mW)
WIFI		
2.4 GHz:		
IEEE 802.11b	23.50 dBm	(223.872 mW)
IEEE 802.11g	23.50 dBm	(223.872 mW)
IEEE 802.11n HT20	21.00 dBm	(125.893 mW)
IEEE 802.11n HT40	23.00 dBm	(199.526 mW)
5 GHz:		
IEEE 802.11a	19.00 dBm	(79.433 mW)
IEEE 802.11n HT20	19.00 dBm	(79.433 mW)
IEEE 802.11n HT40	20.00 dBm	(100.000 mW)
Bluetooth	13.50 dBm	(22.387 mW)

Evaluation applied

☒ MPE Evaluation*
☐ SAR Evaluation
☐ N/A

4. TEST RESULTS

No non-compliance noted.

Calculation

Given $E = \frac{\sqrt{30 \times P \times G}}{d}$ & $S = \frac{E^2}{377}$

Where E = Field strength in Volts / meter
P = Power in Watts
G = Numeric antenna gain
d = Distance in meters
S = Power density in milliwatts / square centimeter

Combining equations and re-arranging the terms to express the distance as a function of the remaining variables yields:

$$S = \frac{30 \times P \times G}{377 d^2}$$

Changing to units of mW and cm, using:

P (mW) = P (W) / 1000 and

d (cm) = d(m) / 100

Yields

$$S = \frac{30 \times (P/1000) \times G}{377 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2}$$ ***Equation 1***

Where d = Distance in cm
P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm²

5. MAXIMUM PERMISSIBLE EXPOSURE

Substituting the MPE safe distance using d = 20 cm into Equation 1:

$$S = 0.000199 \times P \times G$$

Where P = Power in mW
G = Numeric antenna gain
S = Power density in mW / cm²

GPRS850 mode

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
128	824.2	1995.262	0.66	20	0.2621	0.549

EGPRS850 mode

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
128	824.2	501.187	0.66	20	0.0658	0.549

GPRS1900 mode

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
512	1850.2	1000.000	1.32	20	0.2627	1.000

EGPRS1900 mode

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
512	1850.2	398.107	1.32	20	0.1046	1.000

WCDMA Band II mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
9750	1950	251.189	0.91	20	0.0455	1.000

WCDMA Band IV mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
1413	1732.6	251.189	1.23	20	0.0615	1.000

WCDMA Band V mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
4183	836.6	251.189	1.12	20	0.0560	0.558

LTE Band 2:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
18900	1880	251.189	1.32	20	0.0660	1.000

LTE Band 4:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm²	Limit (mW/cm²)
20050	1720	251.189	1.51	20	0.0755	1.000

LTE Band 5:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
20600	844	251.189	0.98	20	0.0490	0.563

LTE Band 13:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
23230	782	251.189	1.26	20	0.0630	0.521

LTE Band 17:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
23790	710	251.189	1.26	20	0.0630	0.473

LTE Band 25:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm^2)
26365	1882.5	251.189	1.32	20	0.0660	1.000

Bluetooth

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
39	2441	22.387	1.88	20	0.0084	1

IEEE 802.11b mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
1	2412	223.872	1.88	20	0.0838	1

IEEE 802.11g mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	223.872	1.88	20	0.0838	1

IEEE 802.11n HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	125.893	1.88	20	0.0471	1

IEEE 802.11n HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
6	2437	199.526	1.88	20	0.0746	1

IEEE 802.11a mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
52	5260	79.433	1.91	20	0.0302	1

IEEE 802.11a HT20 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
157	5785	79.433	1.91	20	0.0302	1

IEEE 802.11a HT40 mode:

Ch.	Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm^2	Limit (mW/cm2)
46	5230	100	1.91	20	0.0380	1

6. SIMULTANEOUS TRANSMISSION SAR ANALYSIS

Only support 2.4G point to point or point-to-multipoint, there are the WWAN and WIFI can transmit simultaneously, the formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

The worst-case situation is 0.2621 / 0.549 + 0.0838 / 1 = 0.5612, which is less than “1”.