



# RADIO FREQUENCY EXPOSURE

## LIMIT

According to FCC, 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.

## EUT Specification

<b>EUT</b>	Computer
<b>Model</b>	TREK-674 ; TREK-674XXXXXXXXXXXXXXXXXX (where "X" may be any alphanumeric character , "-" or blank)
<b>Frequency band (Operating)</b>	<input checked="" type="checkbox"/> GSM 850MHz: 824.2MHz ~ 848.8MHz <input checked="" type="checkbox"/> GSM 1900MHz: 1850.2MHz ~ 1909.8MHz <input checked="" type="checkbox"/> WCDMA Band II: 1852.4MHz ~ 1907.6MHz <input checked="" type="checkbox"/> WCDMA Band V: 826.4MHz ~ 846.6MHz <input checked="" type="checkbox"/> Bluetooth 2.1 + EDR / 4.0: 2402 ~ 2480 MHz 802.11b/g/n HT20: 2412MHz ~ 2462MHz 802.11n HT40: 2422MHz ~ 2452MHz UNII Band 1: 802.11a, 802.11an HT20 : 5180MHz ~ 5240MHz 802.11an HT40 : 5190MHz ~ 5230MHz UNII Band 2A: 802.11a, 802.11an HT20 : 5260MHz ~ 5320MHz 802.11an HT40 : 5270MHz ~ 5310MHz UNII Band 2C: 802.11a, 802.11an HT20 : 5500MHz ~ 5700MHz 802.11an HT40 : 5510MHz ~ 5670MHz UNII Band 3: 802.11a, 802.11an HT20 : 5745MHz ~ 5825MHz 802.11an HT40 : 5755MHz ~ 5795MHz <input type="checkbox"/> Others
<b>Device category</b>	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation) <input type="checkbox"/> Others
<b>Exposure classification</b>	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm <sup>2</sup> ) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm <sup>2</sup> )
<b>Antenna Specification</b>	GSM:           Antenna Gain :   1.00 dBi (Numeric gain 1.26) WCDMA:       Antenna Gain :   1.00 dBi (Numeric gain 1.26) 2.4GHz:       Antenna Gain :   -0.79 dBi (Numeric gain 0.83) 5GHz:          Antenna Gain :   -5.96 dBi (Numeric gain 0.25)



<b>Measurement Average output power</b>	<b>System</b>	<b>Power</b>	
	GSM850	22.59 dBm	(181.55 mW)
	GSM1900	15.94 dBm	(39.26 mW)
	WCDMA Band II	13.85 dBm	(24.27 mW)
	HSDPA Band II	13.96 dBm	(24.89 mW)
	HSUPA Band II	13.86 dBm	(24.32 mW)
	WCDMA Band V	17.84 dBm	(60.81 mW)
	HSDPA Band V	16.68 dBm	(46.56 mW)
	HSUPA Band V	16.69 dBm	(46.67 mW)
	2.4G		
	IEEE 802.11b Mode	23.65 dBm	(231.74 mW)
	IEEE 802.11g Mode	27.92 dBm	(619.44 mW)
	IEEE 802.11gn HT 20 Mode	26.74 dBm	(472.06 mW)
	IEEE 802.11gn HT 40 Mode	25.73 dBm	(374.11 mW)
	Bluetooth 4.0	4.05 dBm	(2.54 mW)
	Bluetooth 2.1 + EDR	6.77 dBm	(4.75 mW)
	5G UNII Band 1		
	IEEE 802.11a Mode	21.53 dBm	(142.23 mW)
	IEEE 802.11an HT 20 Mode	21.69 dBm	(147.57 mW)
	IEEE 802.11an HT 40 Mode	23.13 dBm	(205.59 mW)
	5G UNII Band 2A		
	IEEE 802.11a Mode	21.38 dBm	(137.40 mW)
	IEEE 802.11an HT 20 Mode	21.43 dBm	(139.00 mW)
	IEEE 802.11an HT 40 Mode	22.80 dBm	(190.55 mW)
	5G UNII Band 2C		
	IEEE 802.11a Mode	21.67 dBm	(146.89 mW)
	IEEE 802.11an HT 20 Mode	21.99 dBm	(158.12 mW)
	IEEE 802.11an HT 40 Mode	23.31 dBm	(214.29 mW)
	5G UNII Band 3		
	IEEE 802.11a Mode	21.97 dBm	(157.40 mW)
	IEEE 802.11an HT 20 Mode	22.08 dBm	(161.44 mW)
	IEEE 802.11an HT 40 Mode	22.03 dBm	(159.59 mW)
	<b>Evaluation applied</b>	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A	

**Remark :** 1. For more details, please refer to the User's manual of the EUT.  
 2. The model TREK-674 was considered the main model for testing.



### Revision History

Rev.	Issue Date	Revisions	Effect Page	Revised By
00	2014/11/27	Initial Issue	ALL	Gloria Chang



## **TEST RESULTS**

**No non-compliance noted.**

### **Calculation**

Given  $E = \frac{\sqrt{30 \times P \times G}}{d}$  &  $S = \frac{E^2}{3770}$

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:

$$S = \frac{30 \times P \times G}{3770d^2}$$

Changing to units of mW and cm, using:

$$P \text{ (mW)} = P \text{ (W)} / 1000 \text{ and}$$

$$d \text{ (cm)} = d \text{ (m)} / 100$$

Yields

$$S = \frac{30 \times (P/1000) \times G}{3770 \times (d/100)^2} = 0.0796 \times \frac{P \times G}{d^2} \quad \text{Equation 1}$$

Where  $d$  = Distance in cm

$P$  = Power in mW

$G$  = Numeric antenna gain

$S$  = Power density in mW / cm<sup>2</sup>



**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 / cm<sup>2</sup>

**GSM850 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
850	181.550	1.26	20	0.0455	0.567

**GSM1900 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
1900	39.260	1.26	20	0.0098	1.000

**WCDMA Band II mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
1900	24.890	1.26	20	0.0062	1.000

**WCDMA Band V mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
850	60.810	1.26	20	0.0152	0.567

**IEEE 802.11b mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
2412	231.740	0.83	20	0.0383	1.000

**IEEE 802.11g mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
2437	619.440	0.83	20	0.1023	1.000

**IEEE 802.11gn HT20 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
2412	472.060	0.83	20	0.0780	1.000

**IEEE 802.11gn HT40 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
2437	374.110	0.83	20	0.0618	1.000



**Bluetooth 4.0 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
2480	2.540	0.83	20	0.0004	1.000

**Bluetooth 2.1 + EDR mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
2480	4.750	0.83	20	0.0008	1.000

**UNII Band 1:**

**IEEE 802.11a mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5240	142.230	0.25	20	0.0071	1.000

**IEEE 802.11an HT20 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5240	147.570	0.25	20	0.0073	1.000

**IEEE 802.11an HT40 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5230	205.590	0.25	20	0.0102	1.000

**UNII Band 2A:**

**IEEE 802.11a mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5260	137.400	0.25	20	0.0068	1.000

**IEEE 802.11an HT20 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5260	139.000	0.25	20	0.0069	1.000

**IEEE 802.11an HT40 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5270	190.550	0.25	20	0.0095	1.000



**UNII Band 2C:**

**IEEE 802.11a mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5500	146.890	0.25	20	0.0073	1.000

**IEEE 802.11an HT20 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5500	158.120	0.25	20	0.0079	1.000

**IEEE 802.11an HT40 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5550	214.290	0.25	20	0.0107	1.000

**UNII Band 3:**

**IEEE 802.11a mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5745	157.400	0.25	20	0.0078	1.000

**IEEE 802.11an HT20 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5745	161.440	0.25	20	0.0080	1.000

**IEEE 802.11an HT40 mode:**

Frq.(MHz)	P (mW)	Gain (num.)	D (cm)	Power density in mW / cm <sup>2</sup>	Limit (mW/cm <sup>2</sup> )
5755	159.590	0.25	20	0.0079	1.000

**Simultaneously MPE**

Simultaneously MPE = MPE1/Limit1 + MPE2/Limit2 + MPE3/Limit3

**2G + WiFi + BT**

Simultaneously MPE = 0.0802 + 0.1023 + 0.0008 = 0.1833 mW/cm<sup>2</sup>

**3G + WiFi + BT**

Simultaneously MPE = 0.0268 + 0.1023 + 0.0008 = 0.1299 mW/cm<sup>2</sup>