



Radio Frequency Exposure

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.

EUT Specification

EUT	Mobile Broadband Wireless-N Router
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.725GHz ~ 5.850GHz <input type="checkbox"/> Bluetooth: 2.402GHz ~ 2.480 GHz <input checked="" type="checkbox"/> GSM/GPRS/DEGE: 824MHz ~ 849MHz ; 880MHz ~ 915MHz ; 1.710GHz ~ 1.7850GHz ; 1.850GHz ~ 1.910GHz <input checked="" type="checkbox"/> WCDMA/HSDPA/HSUPA: 824MHz ~ 849MHz ; 830MHz ~ 840MHz ; 1.850GHz ~ 1.910GHz ; 1.920GHz ~ 1.980GHz <input checked="" type="checkbox"/> LTE: 704MHz ~ 716MHz ; 1.710GHZ ~ 1.755GHz
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure (S = 5mW/cm ²) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	<input checked="" type="checkbox"/> Single antenna <input type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input type="checkbox"/> Tx/Rx diversity
Max. output power	802.11b: 20.51 dBm (112.5 mW) 802.11g: 23.56 dBm (227.0 mW) 802.11n (20MHz): 23.01 dBm (200.0 mW) 802.11n (40MHz): 22.98 dBm (198.6 mW) GSM/GPRS/EDGE: 32.39 dBm (1733.8 mW) WCDMA/HSDPA/HSUPA: 24.82 dBm (303.4 mW) LTE: 29.98 dBm (995.4 mW)
Antenna gain (Max)	802.11b/g/n: 4.8 dBi GSM/WCDMA/LTE: 1.37 dBi
Evaluation applied	<input checked="" type="checkbox"/> MPE Evaluation* <input type="checkbox"/> SAR Evaluation <input type="checkbox"/> N/A

Remark:

1. The maximum output power is 32.39 dBm (1733.8 mW) at 824.2 MHz (with numeric 1.37 antenna gain.)
2. DTS device is not subject to routine RF evaluation; MPE estimate is used to justify the compliance.
3. For mobile or fixed location transmitters, no SAR consideration applied. The maximum power density is 1.0 mW/cm² even if the calculation indicates that the power density would be larger.



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:

$$P (mW) = P (W) / 1000 \text{ and}$$
$$d (cm) = d(m) / 100$$

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 / cm²

**Maximum Permissible Exposure****WIFI**

Modulation Mode	Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Power density (mW/cm ²)	Limit (mW/cm ²)	CPD/LPD (MPE %)
802.11b	2412-2462	20.51	4.8	0.068	1	6.8
802.11g	2412-2462	23.56	4.8	0.136	1	13.6
802.11n (20MHz)	2412-2462	23.01	4.8	0.120	1	12.0
802.11n (40MHz)	2422-2452	22.98	4.8	0.119	1	11.9

GSM/WCDMA/LTE

Modulation Mode	Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Power density (mW/cm ²)	Limit (mW/cm ²)	CPD/LPD (MPE %)
GSM/GPRS/EDGE	824-849 880-915	32.39	1.37	0.473	0.549	86.2
	1710-1785 1850-1910	29.66	1.37	0.252	1	25.2
WCDMA/HSDPA/HSUPA	824-849 830-840	24.46	1.37	0.076	0.533	14.3
	1815-1910 1920-1980	24.82	1.37	0.083	1	8.3
LTE	704-716	29.76	1.37	0.258	0.476	54.2
	1710-1755	29.98	1.37	0.271	1	27.1

WIFI + GSM/WCDMA/LTE

Modulation Mode	Distance (cm)	Power density (mW/cm ²)	Limit (mW/cm ²)	Total CPD/LPD (MPE %)	Limit (MPE %)
802.11g + GSM	20	0.998	1	99.8	100

NOTE:

Total (Chain0+Chain1) , the formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density