



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	802.11n Wireless ADSL2+ 4-port Gateway
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.725GHz ~ 5.850GHz ☐ Bluetooth: <u>2.402GHz ~ 2.480 GHz</u>
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation)
Exposure classification	☐ Occupational/Controlled exposure (S = 5mW/cm ²) ☒ General Population/Uncontrolled exposure (S=1mW/cm ²)
Antenna diversity	☐ Single antenna ☒ Multiple antennas ☐ Tx diversity ☐ Rx diversity ☒ Tx/Rx diversity
Max. output power	802.11b: 16.46 dBm (44.26 mW) 802.11g: Chain0:13.65 dBm (23.17 mW) Chain1:14.42 dBm (27.67 mW) 802.11n (20MHz): Chain0:13.82 dBm (24.10 mW) Chain1:14.77 dBm (29.99 mW) 802.11n (40MHz): Chain0:13.89 dBm (24.49 mW) Chain1:14.48 dBm (28.05 mW)
Antenna gain (Max)	Chain0:2.95 dBi (Numeric gain:1.972) Chain1:-1.23 dBi(Numeric gain: 0.753)
Evaluation applied	☒ MPE Evaluation* ☐ SAR Evaluation ☐ N/A

Remark:

1. The maximum output power is 16.77 dBm (44.26 mW) at 2412 MHz (with numeric 1.972 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:

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

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 / cm²

**Maximum Permissible Exposure**

Modulation Mode	Frequency band (MHz)	Max. Conducted output power(dBm)	Antenna gain (dBi)	Distance (cm)	Power density (mW/cm2)	Limit (mW/cm2)
802.11b	2412-2462	16.46	2.95	20	0.0174	1
802.11g(Chain0)	2412-2462	13.65	2.95	20	0.0091	1
802.11g(Chain1)	2412-2462	14.42	-1.23	20	0.0041	1
802.11g(Chain0+Chain1)	2412-2462	/	/	20	0.0132	1
802.11n(20MHz)(Chain0)	2412-2462	13.82	2.95	20	0.0095	1
802.11n(20MHz)(Chain1)	2412-2462	14.77	-1.23	20	0.0045	1
802.11 n(20MHz) (Chain0+Chain1)	2412-2462	/	/	20	0.0140	1
802.11n(40MHz)(Chain0)	2422-2452	13.89	2.95	20	0.0096	1
802.11n(40MHz)(Chain1)	2422-2452	14.48	-1.23	20	0.0042	1
802.11 n(40MHz) (Chain0+Chain1)	2422-2452	/	/	20	0.0138	1

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