



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	Dual WAN VDSL2 Gateway with 802.11n; Wireless N VDSL2 4-ports Gateway with USB
Frequency band (Operating)	<input checked="" type="checkbox"/> WLAN: 2.412GHz ~ 2.462GHz <input type="checkbox"/> WLAN: 5.725GHz ~ 5.850GHz <input type="checkbox"/> Bluetooth: <u>2.402GHz ~ 2.480 GHz</u>
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 type="checkbox"/> Single antenna <input checked="" type="checkbox"/> Multiple antennas <input type="checkbox"/> Tx diversity <input type="checkbox"/> Rx diversity <input checked="" type="checkbox"/> Tx/Rx diversity
Max. output power	802.11b: 21.21 dBm (132.13 mW) 802.11g: 22.12 dBm (162.93 mW) 802.11n (20MHz): Chain0:20.74 dBm (118.58 mW) Chain1:19.62 dBm (91.62 mW) 802.11n (40MHz): Chain0:22.40 dBm (173.78 mW) Chain1:21.20 dBm (131.83 mW)
Antenna gain (Max)	Chain0:5.00 dBi (Numeric gain:3.162) Chain1:5.00 dBi(Numeric gain: 3.162)
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 22.40 dBm (173.78 mW) at 2452 MHz (with numeric 3.162 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:

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

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/cm ²)	Limit (mW/cm ²)
802.11b	2412-2462	21.21	5.00	20	0.083	1
802.11g	2412-2462	22.12	5.00	20	0.103	1
802.11n(20MHz)(Chain0)	2412-2462	20.74	5.00	20	0.075	1
802.11n(20MHz)(Chain1)	2412-2462	19.62	5.00	20	0.058	1
802.11 n(20MHz) (Chain0+Chain1)	2412-2462	/	/	20	0.133	1
802.11n(40MHz)(Chain0)	2422-2452	22.40	5.00	20	0.109	1
802.11n(40MHz)(Chain1)	2422-2452	21.20	5.00	20	0.082	1
802.11 n(40MHz) (Chain0+Chain1)	2422-2452	/	/	20	0.191	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