



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	Wireless N VDSL2 4-port Bonding Combo WAN Gigabit Gateway with MoCA
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
Device category	<input type="checkbox"/> Portable (<20cm separation) <input checked="" type="checkbox"/> Mobile (>20cm separation)
Exposure classification	<input type="checkbox"/> Occupational/Controlled exposure ($S = 5\text{mW/cm}^2$) <input checked="" type="checkbox"/> General Population/Uncontrolled exposure ($S=1\text{mW/cm}^2$)
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: 26.84 dBm (483.05 mW) 802.11g: 26.71 dBm (468.81 mW) 802.11n (20MHz): Chain0:26.21 dBm (417.83 mW) Chain1:24.32 dBm (270.40 mW) 802.11n (40MHz): Chain0:18.04 dBm (63.68 mW) Chain1:17.20 dBm (52.48 mW)
Antenna gain (Max)	Antenna 1 (chain 0) Dipole 3.0dBi(Numeric gain:1.995) Antenna 2 (chain 1) PIFA 3.0dBi(Numeric gain: 1.995)
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 26.84dBm (483.05 mW) at 2412 MHz (with numeric 1.995 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/cm^2 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	26.84	3.00	20	0.192	1
802.11g	2412-2462	26.71	3.00	20	0.186	1
802.11n(20MHz)(Chain0)	2412-2462	26.21	3.00	20	0.166	1
802.11n(20MHz)(Chain1)	2412-2462	24.32	3.00	20	0.107	1
802.11 n(20MHz) (Chain0+Chain1)	2412-2462	/	/	20	0.273	1
802.11n(40MHz)(Chain0)	2422-2452	18.04	3.00	20	0.025	1
802.11n(40MHz)(Chain1)	2422-2452	17.20	3.00	20	0.001	1
802.11 n(40MHz) (Chain0+Chain1)	2422-2452	/	/	20	0.026	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