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	Computing Box
Frequency band (Operating)	☒ WLAN: 2.412GHz ~ 2.462GHz (WALN) ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☐ Others
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others
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	IEEE 802.11b mode: 19.13 dBm (0.08184mW) IEEE 802.11g mode: 22.07 dBm (0.16106mW) draft 802.11n 20 MHz Channel mode: 22.30 dBm (0.16982mW) draft 802.11n 40 MHz Channel mode: 21.42 dBm (0.13867mW)
Antenna gain (Max)	3.8dBi (including cable loss) (Numeric gain: 2.39)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation ☐ N/A

Remark:
1. *The maximum output power is 22.30dBm (0.16982mW) at 2412MHz (with 2.39numeric antenna gain.)*
2. *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.*

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EUT	Computing Box
Frequency band (Operating)	☐ WLAN: 2.412GHz ~ 2.462GHz ☐ WLAN: 5.18GHz ~ 5.32GHz / 5.50GHz ~ 5.70GHz ☐ WLAN: 5.745GHz ~ 5.825GHz ☒ Others Bluetooth: 2.402GHz ~ 2.480GHz
Device category	☐ Portable (<20cm separation) ☒ Mobile (>20cm separation) ☐ Others _____
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	-3.13 dBm (0.486mW)
Antenna gain (Max)	PCB Antenna / -3.3 dBi (Numeric gain: 0.468)
Evaluation applied	☒ MPE Evaluation ☐ SAR Evaluation ☐ N/A

Remark:
1. *The maximum output power is –3.13dBm (0.486mW) at 2480MHz (with 0.468 numeric 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 minimum separation generally be used is at least 20 cm, even if the calculations indicate that the MPE distance would be lesser.*

TEST RESULTS

No non-compliance noted.

WLAN Mode:

Test Mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Antenna Gain (dBi)
IEEE 802.11b	Low	2412	16.06	0.04036	
	Mid	2437	16.23	0.04197	
	High	2462	14.72	0.02964	
IEEE 802.11g	Low	2412	15.01	0.03169	
	Mid	2437	13.75	0.02371	
	High	2462	12.49	0.01774	
draft 802.11n 20 MHz	Low	2412	15.55	0.03589	3.8
	Mid	2437	14.23	0.02648	
	High	2462	12.26	0.01682	
raft 802.11n 40 MHz	Low	2422	14.38	0.02741	
	Mid	2437	13.67	0.23280	
	High	2452	12.77	0.01892	

Bluetooth Mode:

Test Mode	Channel	Frequency (MHz)	Output Power (dBm)	Output Power (W)	Antenna Gain (dBi)
GFSK	Low	2402	-4.40	0.000363	
	Mid	2441	-4.28	0.000373	
	High	2480	-3.85	0.000412	-3.3
8DPSK	Low	2402	-9.00	0.000126	
	Mid	2441	-8.89	0.000129	
	High	2480	-8.54	0.000140	

Note:

GFSK maximum average power is -3.85dBm = 0.412mW <(60/f); Individual SAR is not required.

8DPSK maximum average power is -8.54dBm = 0.140mW <(60/f); Individual SAR is not required.

WLAN Mode: Maximum Permissible Exposure
Test mode: draft 802.11n 20 MHz Channel mode

EUT output power = 169.8mW (Peak Power)

Numeric Antenna gain = 2.4

Substituting the MPE safe distance using d = 20 cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where   P = Power in mW
*   G = Numeric antenna gain*
*   S = Power density in mW / cm^2*
→ *Power density = 0.081108 mW / cm^2*

(For mobile or fixed location transmitters, the maximum power density is 1.0 mW/cm^2 even if the calculation indicates that the power density would be larger.)

Bluetooth Mode: Maximum Permissible Exposure
Test mode: GFSK CH High Channel mode

EUT output power = 0.4864mW (Peak Power)

Numeric Antenna gain = 0.47

Substituting the MPE safe distance using d = 20 cm into Equation 1:

Yields

$$S = 0.000199 \times P \times G$$

Where   P = Power in mW
*   G = Numeric antenna gain*
*   S = Power density in mW / cm^2*
→ *Power density = 0.0000453 mW / cm^2*

CONCULSION:

Both of eh modules can transmit simultaneously, the formula of calculated the MIP is

CPD1/LPD1+CPD2/LPD2+   etc.<1

CPD= Caleulation Power density
LPD= limit of power density

Therefore, the worst-cast situation is 0.081108/1+0.0000453/1= 0.081153, which is less than "1". This confirmed that the device comply with FCC 1.1310 MPE limit.