

RF Exposure evaluation

FCC ID: 2A3RD-IAP2300C

1. Reference

According to §1.1307(b)(1), 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 level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

KDB 662911 D01: Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies

2. Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

3. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S=power density

P=power input to antenna

G=power gain of the antenna in the direction of interest relative to an isotropic radiator

R=distance to the center of radiation of the antenna

4. Result

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$.

For 2.4GHz wifi (Antenna gain: Antenna 1: 3.0 dBi, Antenna 2: 3.0 dBi)

Antenna 1

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11b	2462	16.42	43.8531	1.9953	0.0174	1.0000	PASS
802.11g	2437	15.89	38.8150	1.9953	0.0154	1.0000	PASS
802.11n (HT20)	2412	16.38	43.4510	1.9953	0.0172	1.0000	PASS
802.11n (HT40)	2422	16.06	40.3645	1.9953	0.0160	1.0000	PASS

Antenna 2

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11b	2462	16.19	41.5911	1.9953	0.0165	1.0000	PASS
802.11b	2462	16.03	40.0867	1.9953	0.0159	1.0000	PASS
802.11n (HT20)	2412	14.12	25.8226	1.9953	0.0103	1.0000	PASS
802.11n (HT40)	2437	13.84	24.2103	1.9953	0.0096	1.0000	PASS

MIMO(ANT1+ANT2)

ANT1

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11n (HT20)	2412	16.38	43.4510	1.9953	0.0172	1.0000	PASS

ANT2

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11n (HT20)	2412	14.12	25.8226	1.9953	0.0103	1.0000	PASS

MIMO mode	ANT	Power Density At 20 cm (mW/cm ²) (Max MPE)	Power Density Limit FCC (mW/cm ²)	Result Ratio	Total Ratio (mW/cm ²)	MIMO MPE Limit (mW/cm ²)	Test Results
2.4GHz WIFI	ANT1	0.0172	1.0000	0.0172	0.0275	1.0	PASS
	ANT2	0.0103	1.0000	0.0103			

For 5.1G WIFI (Antenna gain: Antenna 1: Antenna 1: 3.0 dBi, Antenna 2: 3.0 dBi)

Antenna 1

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11a	5260	9.01	7.9616	1.9953	0.0032	1.0000	PASS
802.11n (HT20)	5300	9.51	8.9331	1.9953	0.0035	1.0000	PASS
802.11n (HT40)	5310	9.82	9.5940	1.9953	0.0038	1.0000	PASS

Antenna 2

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
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802.11a	5300	8.01	6.3241	1.9953	0.0025	1.0000	PASS
802.11n (HT20)	5300	8.31	6.7764	1.9953	0.0027	1.0000	PASS
802.11n (HT40)	5270	8.94	7.8343	1.9953	0.0031	1.0000	PASS

MIMO(ANT1+ANT2)

ANT1

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11n (HT40)	5310	9.82	9.5940	1.9953	0.0038	1.0000	PASS

ANT2

	Frequency (MHz)	Max. Output Power (dBm)	Max. Output Power (mW)	Antenna Gain (Numeric)	Power Density At 20 cm (mW/cm ²)	Power Density Limit FCC (mW/cm ²)	Test Results
802.11n (HT40)	5270	8.94	43.4510	1.9953	0.0031	1.0000	PASS

MIMO mode	ANT	Power Density At 20 cm (mW/cm ²) (Max MPE)	Power Density Limit FCC (mW/cm ²)	Result Ratio	Total Ratio (mW/cm ²)	MIMO MPE Limit (mW/cm ²)	Test Results
5GHz WIFI	ANT1	0.0038	1.0000	0.0038	0.0069	1.0	PASS
	ANT2	0.0031	1.0000	0.0031			

Simultaneous transmission MPE

Max.Power Density 2.4G WIFI (mW/cm ²)	Max.Power Density 5G WIFI (mW/cm ²)	Max.sum of the MPE ratios	Simultaneous transmission Ratio Limit	Test Results
0.0174	0.0031	0.0205	1.0	PASS

5. Conclusion

The SAR evaluation is not required.