

## RF Exposure evaluation

FCC ID: 2AMJYANYFREEML

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: Mobile Device

### 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.

KDB447498 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 <sup>2</sup> )	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 <sup>2</sup> )*	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 <sup>2</sup> )	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 <sup>2</sup> )*	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. Antenna Information

the can only use antennas certificated as follows provided by manufacturer;

Type	Antenna type	Range	Max. Gain
Radar	PCB Antenna	24-25GHz	5.0dBi
WLAN ah	FPC antenna	900-950 MHz	0.27dBi

### 5. Manufacturing Tolerance

#### WLAN ah

Mode	Channel	Target Power
BW 1M	Low	$17 \pm 1$ dBm
	Middle	$17 \pm 1$ dBm
	High	$18 \pm 1$ dBm
BW 2M	Low	$18 \pm 1$ dBm
	Middle	$18 \pm 1$ dBm
	High	$18 \pm 1$ dBm
BW 4M	Low	$18 \pm 1$ dBm
	Middle	$19 \pm 1$ dBm
	High	$16 \pm 1$ dBm
BW 8M	Low	$20 \pm 1$ dBm
	Middle	$20 \pm 1$ dBm
	High	$17 \pm 1$ dBm

#### 24G Radar

Frequency (MHz)	FMCW
	24000-24250MHz
Result (dBμV/m)	90.11
Result (dBm)	-5.09
Target (dBm)	-5
Tolerance ± (dB)	1.0

Note: dBm = dBμV/m – 95.2(at 3m)

## 6. Standalone MPE 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,  $r=20\text{cm}$ , as well as the gain of the used antenna list in section 4, the RF power density can be obtained.

### WLAN ah

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	MPE (mW/cm <sup>2</sup> )	MPE Limits (mW/cm <sup>2</sup> )	MPE Radio
	dBm	mW					
OFDM	21	125.8925	0.27	1.0641	0.0267	0.6107	0.0437

### 24G Radar

Modulation Type	Output power(EIRP)		MPE (mW/cm <sup>2</sup> )	MPE Limits (mW/cm <sup>2</sup> )	MPE Radio
	dBm	mW			
FMCW	-4	0.3981	0.0001	1.0000	0.0001

*Remark:*

1. Output power (Average) including turn-up tolerance;
2. Output power was adjust to duty cycle at 100% if measured duty cycle less than 98%;
3. MPE evaluate distance is 20cm from user manual provide by manufacturer.

## 7. Summary simultaneous transmission information

The Device WLAN ah and Radar transmission simultaneously.

## 8. Summary simultaneous transmission results

The EUT have two type RF transmitters, WLAN ah and Radar, and can transmit simultaneously, if the sum of the ratios of all individual transmitters is less than 1, the simultaneously transmit can be exempt.

Max. radio of WLAN ah + Max. radio of Radar=  $0.0437+0.0001=0.0438<1$

## 9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

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