

## RF EXPOSURE EVALUATION

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency(RF) Radiation as specified in §1.1307(b)

Limits for Maximum Permissible Exposure (MPE)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposure</b>				
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
300-1,500			f/300	6
1,500-100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3-1.34	614	1.63	*100	30
1.34-30	824/f	2.19/f	*180/f <sup>2</sup>	30
30-300	27.5	0.073	0.2	30
300-1,500			f/1500	30
1,500-100,000			1.0	30

f = frequency in MHz \* = Plane-wave equivalent power density

### MPE Calculation Method

$$E \text{ (V/m)} = \frac{\sqrt{30 * P * G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Average RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 * P * G}{377 * D^2}$$

From the EUT RF output power, the minimum mobile separation distance, d=0.2m, as well as the gain of the used antenna, the RF power density can be obtained.

## Measurement Result

Operation Frequency:

U-NII-1: 5180-5240MHz for 802.11ac(VHT20); 5190-5230MHz for 802.11ac(VHT40);  
5210MHz for 802.11ac(VHT80);

U-NII-2A: 5260-5320MHz for 802.11ac(VHT20); 5270-5310MHz for 802.11ac(VHT40);  
5290MHz for 802.11ac(VHT80);

U-NII-2C: 5500-5700MHz for 802.11ac(VHT20); 5510-5670MHz for 802.11ac(VHT40);  
5530-5610MHz for 802.11ac(VHT80);

U-NII-3: 5745-5825 MHz for 802.11ac(VHT20); 5755-5795 MHz for 802.11ac(VHT40);  
5775MHz for 802.11ac(VHT80);

Antenna gain:

Integral: WLAN 5G: 8dBi;

External: WLAN 5G: 25dBi;

R=20cm

### SISO Mode

For 8dBi Antenna

Band	Max EIRP Power	Max Conducted Power	Antenna	Separation distance (cm)	Evaluation result	Power density Limits	Verdict
	(dBm)	(dBm)	Gain (dBi)		(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	
WLAN 5.2G Ant1	22.617	14.617	8	20	0.036343	1	PASS
WLAN 5.2G Ant2	21.206	13.206	8	20	0.026262	1	PASS
WLAN 5.3G Ant1	13.446	5.446	8	20	0.004399	1	PASS
WLAN 5.3G Ant2	12.284	4.284	8	20	0.003366	1	PASS
WLAN 5.6G Ant1	13.821	5.821	8	20	0.004795	1	PASS
WLAN 5.6G Ant2	12.042	4.042	8	20	0.003184	1	PASS
WLAN 5.8G Ant1	28.758	20.758	8	20	0.149458	1	PASS
WLAN 5.8G Ant2	28.684	20.684	8	20	0.146933	1	PASS

For 25dBi Antenna

Band	Max EIRP Power	Max Conducted Power	Antenna	Separation distance (cm)	Evaluation result	Power density Limits	Verdict
	(dBm)	(dBm)	Gain (dBi)		(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	
WLAN 5.2G Ant1	23.817	-1.183	25	20	0.047909	1	PASS
WLAN 5.2G Ant2	24.024	-0.976	25	20	0.050248	1	PASS
WLAN 5.3G Ant1	10.589	-14.411	25	20	0.002278	1	PASS
WLAN 5.3G Ant2	8.204	-16.796	25	20	0.001316	1	PASS
WLAN 5.6G Ant1	11.473	-13.527	25	20	0.002793	1	PASS
WLAN 5.6G Ant2	6.859	-18.141	25	20	0.000965	1	PASS
WLAN 5.8G Ant1	21.731	-3.269	25	20	0.029636	1	PASS
WLAN 5.8G Ant2	26.239	1.239	25	20	0.083680	1	PASS

## SIMULTANEOUS TRANSMISSIONS

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE. To comply with the MPE, the fraction of the MPE in terms of  $E^2$ ,  $H^2$  (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity. In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

### Max. SIMULTANEOUS TRANSMISSIONS MODE

For 8dBi Antenna

Band	SISO					MIMO		Verdict	
	Max EIRP	Max conducted	Antenna	Separation distance (cm)	Evaluation result	Power density	Evaluation result		Power density
	(dBm)	(dBm)	Gain (dBi)		(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )		(mW/cm <sup>2</sup> )
WLAN 5.2G	22.617	14.617	8	20	0.036343	1	0.061353	1	PASS
	20.994	12.994	8	20	0.02501	1			
WLAN 5.3G	13.446	5.446	8	20	0.004399	1	0.007744	1	PASS
	12.257	4.257	8	20	0.003345	1			
WLAN 5.6G	13.821	5.821	8	20	0.004795	1	0.007880	1	PASS
	11.906	3.906	8	20	0.003085	1			
WLAN 5.8G	28.734	20.734	8	20	0.148635	1	0.295568	1	PASS
	28.684	20.684	8	20	0.146933	1			

For 25dBi Antenna

Band	SISO					MIMO		Verdict	
	Max EIRP	Max conducted	Antenna	Separation distance (cm)	Evaluation result	Power density Limits	Evaluation result		Power density Limits
	(dBm)	(dBm)	Gain (dBi)		(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )	(mW/cm <sup>2</sup> )		(mW/cm <sup>2</sup> )
WLAN 5.2G	23.817	-1.183	25	20	0.047909	1	0.097823	1	PASS
	23.995	-1.005	25	20	0.049914	1			
WLAN 5.3G	10.589	-14.411	25	20	0.002278	1	0.003495	1	PASS
	7.867	-17.133	25	20	0.001217	1			
WLAN 5.6G	11.473	-13.527	25	20	0.002793	1	0.003439	1	PASS
	5.113	-19.887	25	20	0.000646	1			
WLAN 5.8G	21.731	-3.269	25	20	0.029636	1	0.113316	1	PASS
	26.239	1.239	25	20	0.08368	1			

Signature:

Date: 2021-06-11

*Alex*

**NAME AND TITLE** (Please print or type): Alex/Manager

**COMPANY** (Please print or type): Shenzhen NTEK Testing Technology Co., Ltd./ 1/F, Building E, Fenda Science Park, Sanwei Community, Xixiang Street Bao'an District, Shenzhen P.R. China.