

RF Exposure

FCC ID: SRQ-MF286C

Applicant: ZTE Corporation

Exposure category: General population/uncontrolled environment

EUT Type: Production Unit

Device Type: 4G Wireless Router

Refer Standard: FCC Part 2.1091: Radio Frequency (RF) Exposure Compliance of Radio communication Apparatus (All Frequency Bands)

FCC MPE Limited:

Limits for General Population/Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Averaging Time (minutes)
0.3-1.34	614	1.63	*(100)	30
1.34-30	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

Test Data

Predication of MPE limit at a given distance

$$S = \frac{PG}{4\pi R^2}$$

Where: S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator, the power gain factor, is normally numeric gain.

R = distance to the center of radiation of the antenna (appropriate units, e.g., cm)

2.4G WLAN Antenna Gain information

Antenna 1: 2.0dBi

Antenna 2: 2.0dBi

Directional Gain=5.01dBi

5G WLAN Antenna Gain information

Antenna 1: 3.0dBi

Antenna 2: 3.0dBi

Directional Gain=6.01dBi_{note1}

Note 1: According to KDB 662911, all transmit signals are completely correlated with each other.

2. Directional gain = $G_{ANT} + 10 \log(N_{ANT})$ dBi

WWAN Antenna Gain:

GPRS850/WCDMA Band 5: 0.5dBi

GPRS1900/WCDMA Band 2: 1.7dBi

WCDMA Band 4:1.7dBi

LTE Band 2:1.7dBi

LTE Band 4:1.7dBi

LTE Band 5: 0.5dBi

LTE Band 7: 2dBi

LTE Band 12: 0.5dBi

LTE Band 66: 1.7dBi

Worst-Case mode Conducted Output Power Results for 2.4G WIFI

802.11b mode

Channel	Frequency (MHz)	Output Power(dBm)		Tune Up tolerance(dBm)
		Ant. 0	Ant. 1	
1	2412	16.53	16.53	16 ± 1
6	2437	16.19	16.44	16 ± 1
11	2462	16.38	16.83	16 ± 1

802.11g Test mode

Channel	Frequency (MHz)	Output Power(dBm)		Tune Up tolerance(dBm)
		Ant. 0	Ant. 1	
1	2412	14.42	14.70	14 ± 1
6	2437	14.61	14.58	14 ± 1
11	2462	14.59	14.94	14 ± 1

802.11n-20MHz Test mode

Channel	Frequency (MHz)	Output Power(dBm)			Tune Up tolerance(dBm)
		Ant. 0	Ant. 1	Ant. 0+1	
1	2412	14.42	14.50	17.47	17 ± 1
6	2437	14.42	14.39	17.42	17 ± 1
11	2462	14.38	14.70	17.55	17 ± 1

802.11n-40MHz Test mode

Channel	Frequency (MHz)	Output Power(dBm)			Tune Up tolerance(dBm)
		Ant. 0	Ant. 1	Ant. 0+1	
3	2422	13.64	14.80	17.27	17 ± 1
6	2437	13.22	14.69	17.03	17 ± 1
9	2452	12.73	13.45	16.12	17 ± 1

Conducted Power Test results of band U-NII-1 (5150 ~ 5250 MHz)

802.11a mode				
Frequency (MHz)	Conducted Output Power (dBm)		Tune Up tolerance(dBm)	
	Antenna 0	Antenna 1		
5180	15.43	16.32	16±1	
5220	15.53	16.16	16±1	
5240	15.66	16.29	16±1	
802.11n-HT20 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5180	13.20	13.89	16.57	16±1
5220	13.28	14.13	16.74	16±1
5240	13.37	14.19	16.81	16±1
802.11n-HT40 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5190	14.46	15.04	17.77	17±1
5230	14.45	14.98	17.73	17±1
802.11ac-VHT20 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5180	13.25	13.95	16.62	16±1
5220	13.39	14.13	16.79	16±1
5240	13.40	14.15	16.80	16±1
802.11ac-VHT40 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5190	14.47	15.03	17.77	17±1
5230	14.48	15.04	17.78	17±1
802.11ac-VHT80 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5210	14.39	14.81	17.62	17±1

Conducted Power Test results of band U-NII-3 (5725 ~ 5850 MHz)

802.11a mode				
Frequency (MHz)	Conducted Output Power (dBm)		Tune Up tolerance(dBm)	
	Antenna 0	Antenna 1		
5745	15.66	16.40	16 ± 1	
5785	15.43	16.33	16 ± 1	
5825	15.22	16.11	16 ± 1	
802.11n-HT20 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5745	13.71	14.20	16.97	16 ± 1
5785	13.33	13.59	16.47	16 ± 1
5825	13.02	13.26	16.15	16 ± 1
802.11n-HT40 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5755	13.80	12.92	16.39	16 ± 1
5795	13.58	12.87	16.25	16 ± 1
802.11ac-VHT20 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5745	13.76	13.57	16.68	16 ± 1
5785	13.36	13.92	16.66	16 ± 1
5825	13.10	13.58	16.36	16 ± 1
802.11ac-VHT40 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5755	13.85	12.92	16.42	16 ± 1
5795	13.45	12.89	16.19	16 ± 1
802.11ac-VHT80 mode				
Frequency (MHz)	Conducted Output Power (dBm)			Tune Up tolerance(dBm)
	Antenna 0	Antenna 1	Total	
5775	13.36	12.75	16.08	16 ± 1

Calculation results (for 2.4G WIFI): Worst-case mode

Antenna	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Result (mW/cm2)	Limit (mW/cm2)
0+1(MIMO)	2412	18	20	0.040	1.0
	2437	18	20	0.040	
	2462	18	20	0.040	
	2422	18	20	0.040	
	2452	18	20	0.040	

Calculation results (for 5.2G WIFI band U-NII-1): Worst-Case mode

Antenna	Mode	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Result (mW/cm2)	Limit (mW/cm2)
0+1(MIMO)	N20	5180	17	20	0.040	1.0
		5220	17	20	0.040	
		5240	17	20	0.040	
		5745	17	20	0.040	
		5785	17	20	0.040	
		5825	17	20	0.040	
	N40	5190	18	20	0.050	
		5230	18	20	0.050	
		5755	17	20	0.040	
		5795	17	20	0.040	
	AC20	5180	17	20	0.040	
		5220	17	20	0.040	
		5240	17	20	0.040	
		5745	17	20	0.040	
		5785	17	20	0.040	
		5825	17	20	0.040	
	AC40	5190	18	20	0.050	
		5230	18	20	0.050	
		5755	17	20	0.040	
		5795	17	20	0.040	
	AC80	5210	18	20	0.040	
		5775	17	20	0.040	

Worst-Case mode Conducted Output Power Results for WWAN

Band	Channel	Frequency (MHz)	Max Tune up power(dBm)	Max Tune up power(mW)	Duty cycle(%)	Average power(mW)
GPRS850	Low	824.2	33.00	1995.3	12.5	249.41
	Mid	836.6	33.00	1995.3	12.5	249.41
	High	848.8	33.00	1995.3	12.5	249.41
GPRS1900	Low	1850.2	31.00	1258.9	12.5	157.36
	Mid	1880	31.00	1258.9	12.5	157.36
	High	1909.8	31.00	1258.9	12.5	157.36
WCDMA850	Low	826.4	23.00	199.5	100	199.5
	Mid	836.6	23.00	199.5	100	199.5
	High	846.4	23.00	199.5	100	199.5
WCDMA1900	Low	1852.4	23.00	199.5	100	199.5
	Mid	1880	23.00	199.5	100	199.5
	High	1907.6	23.00	199.5	100	199.5
WCDMA1700	Low	1852.4	23.00	199.5	100	199.5
	Mid	1880	23.00	199.5	100	199.5
	High	1907.6	23.00	199.5	100	199.5
LTE Band 2	Low	1860	23.00	199.5	100	199.5
	Mid	1880	23.00	199.5	100	199.5
	High	1900	23.00	199.5	100	199.5
LTE Band 4	Low	1720	23.00	199.5	100	199.5
	Mid	1732.5	23.00	199.5	100	199.5
	High	1745	23.00	199.5	100	199.5
LTE Band 5	Low	829	23.00	199.5	100	199.5
	Mid	836.5	23.00	199.5	100	199.5
	High	844	23.00	199.5	100	199.5
LTE Band 7	Low	2510	23.00	199.5	100	199.5
	Mid	2535	23.00	199.5	100	199.5
	High	2560	23.00	199.5	100	199.5
LTE Band 12	Low	704	23.00	199.5	100	199.5
	Mid	707.5	23.00	199.5	100	199.5
	High	711	23.00	199.5	100	199.5
LTE Band 66	Low	1720	23.00	199.5	100	199.5
	Mid	1745	23.00	199.5	100	199.5
	High	1770	23.00	199.5	100	199.5

Calculation results (for WWAN): pass

Band	Channel	Frequency (MHz)	Result(mW/cm2)	Limit(mW/cm2)	Ratio
GPRS850	Low	824.2	0.06	0.55	0.11
	Mid	836.6	0.06	0.56	0.11
	High	848.8	0.06	0.57	0.11
GPRS1900	Low	1850.2	0.05	1.0	0.05
	Mid	1880	0.05	1.0	0.05
	High	1909.8	0.05	1.0	0.05
WCDMA850	Low	826.4	0.04	0.55	0.07
	Mid	836.6	0.04	0.56	0.07
	High	846.4	0.04	0.57	0.07
WCDMA1900	Low	1852.4	0.05	1.0	0.05
	Mid	1880	0.05	1.0	0.05
	High	1907.6	0.05	1.0	0.05
LTE Band 2	Low	1860	0.05	1.0	0.05
	Mid	1880	0.05	1.0	0.05
	High	1900	0.05	1.0	0.05
LTE Band 4	Low	1720	0.05	1.0	0.05
	Mid	1732.5	0.05	1.0	0.05
	High	1745	0.05	1.0	0.05
LTE Band 5	Low	829	0.04	1.0	0.04
	Mid	836.5	0.04	1.0	0.04
	High	844	0.04	1.0	0.04
LTE Band 7	Low	2510	0.06	1.0	0.06
	Mid	2535	0.06	1.0	0.06
	High	2560	0.06	1.0	0.06
LTE Band 12	Low	704	0.04	1.0	0.04
	Mid	707.5	0.04	1.0	0.04
	High	711	0.04	1.0	0.04
LTE Band 66	Low	1720	0.05	1.0	0.05
	Mid	1745	0.05	1.0	0.05
	High	1770	0.05	1.0	0.05

Manufacturing tolerance

Band	Max. RF Power(dBm)	Target (dBm)	Tolerance $\pm$ (dB)	Max Tune up power
GPRS850	32.5	32.0	1	33.0
GPRS1900	29.9	30.0	1	31.0
WCDMA850	22.42	22.0	1	23.0
WCDMA1900	22.63	22.0	1	23.0
WCDMA1700	22.52	22.0	1	23.0
LTE Band 2	22.20	22.0	1	23.0
LTE Band 4	22.05	22.0	1	23.0
LTE Band 5	22.23	22.0	1	23.0
LTE Band 7	21.14	22.0	1	23.0
LTE Band 12	22.83	22.0	1	23.0
LTE Band 66	21.93	22.0	1	23.0

Simultaneous Transmission Calculation (Worst-case mode)

No.	Transmitter Combinations	Scenario Supported or not
1	WWAN+2.4G WLAN	Yes
2	WWAN +5G WLAN	Yes

Antenna	Mode/Channel	Calculation results(mW/cm ²)	Limit (mW/cm ²)
WWAN	GPRS850/ LTE Band 7	0.06	0.55
WLAN	2.4G WIFI	0.04	1.0
WLAN	5G WIFI	0.05	1.0

No.	Mode	MPE Ratio	Results
1	WWAN +5G WIFI	0.109+0.05	0.114<1.0(pass)