

# MPE

**FCC ID:** SRQ-MF253V

**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 <sup>2</sup> )	Averaging Time (minutes)
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
300-1500	/	/	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 Gain1: 2.96dBi=1.98

Antenna Gain2: 2.99dBi=1.99

Antenna Gain1+2: 2.98dBi=1.99<sub>note1</sub>

Note 1: According to KDB 662911, all transmit signals are completely uncorrelated with each other. Directional gain =  $G_{ANT}$

WWAN Antenna Gain:

GPRS850/WCDMA Band 5: 1.22dBi

GPRS1900/WCDMA Band 2: 2.97dBi

LTE Band 4: 2.86dBi

LTE Band 7:2.71dBi

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

Antenna	Mode	Frequency (MHz)	Max.RF Power(dBm)
1	802.11g	2412	25.50
	802.11g	2437	26.27
	802.11g	2462	24.85

Antenna	Mode	Frequency (MHz)	Max.RF Power(dBm)
2	802.11g	2412	25.95
	802.11g	2437	26.52
	802.11g	2462	25.45

Antenna	Mode	Frequency (MHz)	Max.RF Power(dBm)
1+2	802.11n20	2412	24.91
	802.11n20	2437	25.49
	802.11n20	2462	25.23

### Manufacturing tolerance

Antenna	Mode/Channel	Frequency (MHz)	Max. RF Power(dBm)	Target (dBm)	Tolerance $\pm$ (dB)
1	802.11g/1	2412	25.50	25.5	1
	802.11g/6	2437	26.27	25.5	1
	802.11g/11	2462	24.85	25.5	1

Antenna	Mode/Channel	Frequency (MHz)	Max. RF Power(dBm)	Target (dBm)	Tolerance $\pm$ (dB)
2	802.11g/1	2412	25.95	26	1
	802.11g/6	2437	26.52	26	1
	802.11g/11	2462	25.45	26	1

Antenna	Mode/Channel	Frequency (MHz)	Max. RF Power(dBm)	Target (dBm)	Tolerance $\pm$ (dB)
1+2	802.11n20/1	2412	24.91	25	1
	802.11n20/6	2437	25.49	25	1
	802.11n20/11	2462	25.23	25	1

**Calculation results (for 2.4G WIFI): pass**

Antenna	Mode	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Result (mW/cm2)	Limit (mW/cm2)
1	802.11g	2412	26.5	20	0.18	1.0
	802.11g	2437	26.5	20	0.18	
	802.11g	2462	26.5	20	0.18	
Antenna	Mode	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Result (mW/cm2)	Limit (mW/cm2)
2	802.11g	2412	27	20	0.20	1.0
	802.11g	2437	27	20	0.20	
	802.11g	2462	27	20	0.20	
Antenna	Mode	Frequency (MHz)	Maximum tune up power(dBm)	RF distance(cm)	Result (mW/cm2)	Limit (mW/cm2)
1+2	802.11n20	2412	26	20	0.16	1.0
	802.11n20	2437	26	20	0.16	
	802.11n20	2462	26	20	0.16	

**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	22.00	158.5	100	158.5
	Mid	1880	22.00	158.5	100	158.5
	High	1907.6	22.00	158.5	100	158.5
LTE Band 4 (QPSK, 20MHz BW)	Low	1720	22.50	177.8	100	177.8
	Mid	1732.5	22.50	177.8	100	177.8
	High	1745	22.50	177.8	100	177.8
LTE Band 7(QPSK, 20MHz BW)	Low	2510	22.50	177.8	100	177.8
	Mid	2535	22.50	177.8	100	177.8
	High	2560	22.50	177.8	100	177.8

**Calculation results (for WWAN): pass**

Band	Channel	Frequency (MHz)	Result(mW/cm2)	Limit(mW/cm2)	Ratio
GPRS850	Low	824.2	0.07	0.55	0.13
	Mid	836.6	0.07	0.56	0.13
	High	848.8	0.07	0.57	0.12
GPRS1900	Low	1850.2	0.06	1.0	0.06
	Mid	1880	0.06	1.0	0.06
	High	1909.8	0.06	1.0	0.06
WCDMA850	Low	826.4	0.05	0.55	0.09
	Mid	836.6	0.05	0.56	0.09
	High	846.4	0.05	0.57	0.09
WCDMA1900	Low	1852.4	0.06	1.0	0.06
	Mid	1880	0.06	1.0	0.06
	High	1907.6	0.06	1.0	0.06
LTE Band 4 (QPSK, 20MHz BW)	Low	1720	0.07	1.0	0.07
	Mid	1732.5	0.07	1.0	0.07
	High	1745	0.07	1.0	0.07
LTE Band 7(QPSK, 20MHz BW)	Low	2510	0.07	1.0	0.07
	Mid	2535	0.07	1.0	0.07
	High	2560	0.07	1.0	0.07

**Manufacturing tolerance**

Band	Max. RF Power(dBm)	Target (dBm)	Tolerance ±(dB)
GPRS850	31.52	32.0	1
GPRS1900	29.81	30.0	1
WCDMA850	22.86	22.0	1
WCDMA1900	21.75	21.0	1
LTE Band 4	21.84	21.5	1
LTE Band 7	21.78	21.5	1

**Simultaneous Transmission Calculation (Worst-case mode)**

Antenna	Mode/Channel	Frequency (MHz)	Calculation results(mW/cm2)	Limit (mW/cm2)	Ratio
WWAN	GPRS850/low	824.2	0.07	0.55	0.13
WLAN	802.11b/low	2412	0.20	1.0	0.20
WWAN+WLAN=0.33<1.0, pass					