RF Exposure Evaluation For FCC ID: 2AFTXRT880

Refer user manual this device is 4G LTE Cat.4 CPE which support 2G&3G&4G network&2.4 G WLAN, and this device was designed used in Mobile devices that the minimum distance between human's body is 30**cm.** Based on the 47CFR 2.1091, this device belongs to Mobile device. The definition of the category as following:

Mobile Derives:

CFR Title 47 § 2.1091(b)

(b) For purposes of this section, a mobile device is defined as a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 centimeters is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons.

FCC KDB 447498 D01 General RF Exposure Guidance v06 Limit

Devices operating in standalone mobile exposure conditions may contain a single transmitter or multiple transmitters that do not transmit simultaneously. A minimum test separation distance ≥ 20 cm is required between the antenna and radiating structures of the device and nearby persons to apply mobile device exposure limits. The distance must be fully supported by the operating and installation configurations of the transmitter and its antenna(s), according to the source-based time-averaged maximum power requirements of § 2.1091(d)(2). In cases where cable losses or other attenuations are applied to determine compliance, the most conservative operating configurations and exposure conditions must be evaluated. The minimum test separation distance required for a device to comply with mobile exposure conditions must be clearly identified in the installation and operating instructions, for all installation and exposure conditions, to enable users and installers to comply with RF exposure requirements. For mobile devices that have the potential to operate in portable device exposure conditions, similar to the configurations described in § 2.1091(d)(4), a KDB inquiry is required to determine the SAR test requirements for demonstrating compliance.

When the categorical exclusion provision of § 2.1091(c) applies, the minimum test separation distance may be estimated, when applicable, by simple calculations according to plane-wave equivalent conditions, to ensure the transmitter and its antenna(s) can operate in manners that meet or exceed the estimated distance. The source-based time-averaged maximum radiated power, according to the maximum antenna gain, must be applied to calculate the field strength and power density required to establish the minimum test separation distance. When the estimated test separation distance becomes overly conservative and does not support compliance, MPE measurement or computational modeling may be used to determine the required minimum separation distance.

RF Exposure Evaluation Result:

FCC (Worst case)

According to FCC Part 1.1307, systems operating under the provisions of this section shall be operated in a manner the ensures that the public is not exposed to radio frequency energy level in excess of the commission's guidelines.

Limits for General Population/ Uncontrolled Exposure			
Frequency Range (MHz)	Electric Field Strength(E)(V/m)	Magnetic Field Strength (H)(A/m)	Power Density (S)(mW/cm2)
0.3-1.34	614	1.63	(100)*
1.34-30	824/f	2.19/f	(180/f2)*
30-300	27.5	0.073	0.2
300-1500			f/1500
1500-100,000			1.0

MPE calculation formula

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

Where:

S = power density

P = output power (mW)

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

R = Separation distance between radiator and human body (cm)

Test result:

Note1:

There are two main antennas and two diversity antennas for WWAN. Two diversity antennas only support receiving signal. Two main antennas support transceiving, and can switch. But main antennas can't transmit simultaneously. There are only worst case for worst antenna gain.

GSM 850	
Maximum peak output power at antenna input terminal(dBm):	34.30
Maximum peak output power at antenna input terminal(mW):	2660.73
Prediction distance(cm):	30
Predication frequency(MHz):	848.8
Antenna Gain (typical) (dBi):	2.8
Power density at predication frequency at 30cm(mW/cm2):	0.448
MPE limit for RF exposure at prediction frequency(mW/cm2):	0.566

GSM 1900	
Maximum peak output power at antenna input terminal(dBm):	27.85
Maximum peak output power at antenna input terminal(mW):	609.54
Prediction distance(cm):	30
Predication frequency(MHz):	1850.2
Antenna Gain (typical) (dBi):	5.0
Power density at predication frequency at 30 cm(mW/cm2):	0.170
MPE limit for RF exposure at prediction frequency(mW/cm2):	1

WCDMA Band 2	
Maximum peak output power at antenna input terminal(dBm):	22.52
Maximum peak output power at antenna input terminal(mW):	178.65
Prediction distance(cm):	30
Predication frequency(MHz):	1907.6
Antenna Gain (typical) (dBi):	5.0
Power density at predication frequency at 30 cm(mW/cm2):	0.050
MPE limit for RF exposure at prediction frequency(mW/cm2):	1.0

WCDMA Band 5	
Maximum peak output power at antenna input terminal(dBm):	22.22
Maximum peak output power at antenna input terminal(mW):	166.72
Prediction distance(cm):	30
Predication frequency(MHz):	826.4
Antenna Gain (typical) (dBi):	2.8
Power density at predication frequency at 30 cm(mW/cm2):	0.028
MPE limit for RF exposure at prediction frequency(mW/cm2):	0.551

LTE Band 2	
Maximum peak output power at antenna input terminal(dBm):	23.16
Maximum peak output power at antenna input terminal(mW):	207.01
Prediction distance(cm):	30
Predication frequency(MHz):	1909.3
Antenna Gain (typical) (dBi):	5.0
Power density at predication frequency at 30 cm(mW/cm2):	0.058
MPE limit for RF exposure at prediction frequency(mW/cm2):	1.0

LTE Band 7	
Maximum peak output power at antenna input terminal(dBm):	21.42
Maximum peak output power at antenna input terminal(mW):	138.68
Prediction distance(cm):	30
Predication frequency(MHz):	3035
Antenna Gain (typical) (dBi):	3.8
Power density at predication frequency at 30 cm(mW/cm2):	0.029
MPE limit for RF exposure at prediction frequency(mW/cm2):	1.0

Note2:

There are two antennas for WLAN. Double antennas support 802.11 b, 802.11 g and 802.11 n. But only 802.11n mode can simultaneously transmit at same time, and the two antenna are MIMO with cross-polarized antennas.

Radiated measurements for WLAN in this report please refer to KDB 662911 D02.

2.4G WLAN 802.11n (HT 20MHz) (ANT 0 & ANT 1)	
Maximum conducted peak output power at ANT 0 input terminal (dBm)	16.57
Maximum conducted peak output power at ANT 0 input terminal (mW)	45.39
Maximum conducted peak output power at ANT 1 input terminal (dBm)	16.84
Maximum conducted peak output power at ANT 1 input terminal (mW)	48.31
Total conducted peak output power at total antenna input terminal (dBm)	19.72
Total conducted peak output power at total antenna input terminal (mW)	93.70
Predication distance (cm)	30
Predication frequency (MHz)	2412
Antenna 0 Gain (dBi)	0.8
Antenna 1 Gain (dBi)	0.8
Maximum Antenna Gain (dBi)	0.8
Power density at predication frequency at 30 cm (mW/cm^2)	0.01
MPE limit for RF exposure at prediction frequency(mW/cm^2)	1.0

Conclusion:

Compared with other results, the result is the worst case at GSM 850 mode, but the result still below the MPE limit for RF exposure at prediction frequency. The verdict is pass.