

MPE Calculation

Product:	Xiaomi Box 4K
Model no.:	MDZ-28-AA
FCC ID:	2AIMRMITVMDZ28AA
Rating:	5.2VDC, 2.1A(Supplied by AC/DC Adapter) Adapter information: Model: AD-0100520210US-1 Input: 100-240V~50/60Hz, 0.3A Output: 5.2VDC, 2.1A, 10.92W
RF Transmission Frequency:	Bluetooth BR+EDR: 2402-2480MHz Bluetooth LE: 2402-2480MHz Wi-Fi 2.4G: 2412-2462MHz Wi-Fi 5G: 5150MHz~5350MHz; Wi-Fi 5G: 5470MHz – 5725MHz Wi-Fi 5G: 5725MHz – 5850MHz. Note: until further notice, device subject to this section shall not be capable of transmitting in the band 5600-5650MHz. This restriction is for the protection of Environment Canada's weather radars operating in this band
Antenna Type:	Internal Antenna
Max Antenna Gain:	Bluetooth: 0.5dBi Wi-Fi 2.4G Ant 1: 0.5dBi, Ant 2: 0.5dBi Wi-Fi 5G Ant 1: 2dBi, Ant 2: 2dBi
Description of the EUT:	The EUT is a Xiaomi Box 4K with Bluetooth, 2.4GHz Wi-Fi and 5GHz Wi-Fi function. Bluetooth TX and RX range is 2402-2480MHz, Wi-Fi TX and RX is 2412-2462MHz, 5150-5250MHz, 5250-5350MHz, 5470-5725MHz, 5745-5825MHz.

According to subpart 15.247(i) and subpart §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.

Limits for Maximum Permissible Exposure (MPE) (§1.1310, §2.1091)

(B) 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
300–1,500	/	/	f/1500	30
1,500–100,000	/	/	1.0	30

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

According to §1.1310 and §2.1091 RF exposure is calculated.

Calculated Formulary:

Predication of MPE limit at a given distance

$S = PG/4\pi R^2$ = power density (in appropriate units, e.g. mW/cm²);

P = power input to the antenna (in appropriate units, e.g., mW);

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);

Calculated Data:

for 5G Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	15.03
Maximum peak output power at antenna input terminal (mW):	31.84
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	2
Maximum Antenna Gain (numeric):	1.58
The worst case is power density at predication frequency at 20 cm (mW/cm2):	0.0100
MPE limit for general population exposure at prediction frequency (mW/cm2):	1.0

For 2.4G Wi-Fi

Maximum peak output power at antenna input terminal (dBm):	16.46
Maximum peak output power at antenna input terminal (mW):	44.26
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.12
The worst case is power density at predication frequency at 20 cm (mW/cm2):	0.0099
MPE limit for general population exposure at prediction frequency (mW/cm2):	1.0

For BR+EDR

Maximum peak output power at antenna input terminal (dBm):	6.71
Maximum peak output power at antenna input terminal (mW):	4.69
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.12
The worst case is power density at predication frequency at 20 cm (mW/cm2):	0.0010
MPE limit for general population exposure at prediction frequency (mW/cm2):	1.0

For BLE

Maximum peak output power at antenna input terminal (dBm):	6.76
Maximum peak output power at antenna input terminal (mW):	4.74
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	0.5
Maximum Antenna Gain (numeric):	1.12
The worst case is power density at predication frequency at 20 cm (mW/cm2):	0.0011
MPE limit for general population exposure at prediction frequency (mW/cm2):	1.0

For simultaneous transmission

Simultaneous transmission configuration	Power density(mW/cm2)	MPE Limit (mW/cm2)
2.4GHz Wi-Fi +BDR+EDR	0.0109	1.0
5GHz Wi-Fi +BDR+EDR	0.0110	1.0
5G Wi-Fi+BLE	0.0111	1.0
2.4G Wi-Fi+BLE	0.0110	1.0

Result: Compliant

TUV SUD China, Shenzhen Branch

Reviewed by:

John Zhi/ Project Manager
Date: 2022-08-17

Prepared By:

Mark Chen/Project Engineer
Date: 2022-08-17