MPE Calculation

Applicant:	Jiangsu Toppower Automotive Electronics Co., Ltd
Address:	No. 19 Fenghuang Avenue, Xuzhou Economic And Technological Development Zone Xuzhou, 221000 China
Product:	ISMART1.0
FCC ID:	2AFIXISMART
Model No.:	ZS11E; ZS11MCE3
Reference RF report #	7088819112401-00 7088819112402-00 7088819112403-00 7088819112404-00

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/f²)	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/cm^2);
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: PIFA antenna
For 2.4GHz Bluetooth 4.1+EDR (Report number: 7088819112401-00)

Maximum peak output power at antenna input terminal (dBm):	0.23
Maximum peak output power at antenna input terminal (mW):	1.05
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	2.04
Maximum Antenna Gain (numeric):	1.5996
The worst case is power density at predication frequency at 20 cm (mW/cm^2):	0.0003
MPE limit for general population exposure at prediction frequency (mW/cm^2):	1.00

For 2.4GHz Bluetooth BLE (Report number: 7088819112402-00)

Maximum peak output power at antenna input terminal (dBm):	-1.75
Maximum peak output power at antenna input terminal (mW):	0.67
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	2.04
Maximum Antenna Gain (numeric):	1.5996
The worst case is power density at predication frequency at 20 cm (mW/cm^2):	0.0002
MPE limit for general population exposure at prediction frequency (mW/cm^2):	1.00

For 2.4GHz Wi-Fi (Report number: 7088819112403-00)

Maximum peak output power at antenna input terminal (dBm):	21.88
Maximum peak output power at antenna input terminal (mW):	154.17
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	2.04
Maximum Antenna Gain (numeric):	1.5996
The worst case is power density at predication frequency at 20 cm (mW/cm^2):	0.0491
MPE limit for general population exposure at prediction frequency (mW/cm^2):	1.00

For 5GHz Wi-Fi (Report number: 7088819112404-00)

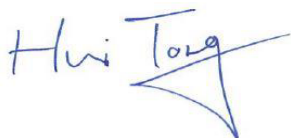|	
Maximum peak output power at antenna input terminal (dBm):	22.64
Maximum peak output power at antenna input terminal (mW):	183.65
Prediction distance (cm):	20
Antenna Gain, typical (dBi):	5.52
Maximum Antenna Gain (numeric):	3.5645
The worst case is power density at predication frequency at 20 cm (mW/cm^2):	0.1302
MPE limit for general population exposure at prediction frequency (mW/cm^2):	1.00

The max power density 0.1302 (mW/cm2) < 1 (mW/cm2)
Result: Compliant

- TÜV SÜD Certification and Testing (China) Co., Ltd. Shanghai Branch

Reviewed by:	Prepared by:	Tested by:
Hui TONG	Jiaxi XU	Wenqiang LU
EMC Section Manager	EMC Project Engineer	EMC Test Engineer
Date: 10-27, 2019	Date: 10-27, 2019	Date: 10-27, 2019