

Prediction of MPE at a given distance

1. Description of Device

Applicant	: Shanghai Huace Navigation Technology Ltd.
Address	: 577 Songying Road, Qingpu District, 201706 Shanghai, China
EUT Description	: Display
Model No.	: MCPad300
Trademark	: 
Radio Technology	: Bluetooth EDR&BLE
Operation frequency	: 2402-2480MHz
Modulation type	: GFSK, $\pi/4$ DQPSK, 8DPSK for EDR GFSK for BLE
Radio Technology	: 2.4G WIFI
Operation frequency	: 2412MHz-2462MHz for IEEE 802.11 b, g, n/HT20 2422MHz~2452MHz for IEEE802.11n/HT40 IEEE 802.11b: DSSS(CCK,DQPSK,DBPSK)
Modulation type	: IEEE 802.11g: OFDM(64QAM, 16QAM, QPSK, BPSK) IEEE 802.11n :OFDM(64QAM, 16QAM, QPSK, BPSK)
Radio Technology	: 5G WIFI
Operation Frequency	: 802.11a/n(HT20)/ac(HT20): 5180~5240MHz, 5260-5320MHz, 5500-5700, 5745~5825MHz 802.11n(HT40)/ac(HT40): 5190~5230MHz, 5260-5320MHz, 5500-5700, 5755~5795MHz 802.11ac(HT80): 5210MHz, 5290MHz, 5775MHz, 5500-5700;
Modulation technology:	: IEEE 802.11n: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11a: OFDM (64QAM, 16QAM, QPSK, BPSK) IEEE 802.11ac: OFDM (64QAM, 16QAM, QPSK, BPSK)
Support Networks	: GPRS, EGPRS, WCDMA
Support Bands	: GSM850, PCS1900, WCDMA Band V, WCDMA Band IV, WCDMA Band II GSM850: 824.20MHz-848.80MHz PCS1900: 1850.20MHz-1909.80MHz
TX Frequency	: WCDMA Band V: 826.40MHz -846.60MHz WCDMA Band II: 1852.40MHz -1907.60MHz WCDMA Band IV: 1710MHz -1755MHz GSM/GPRS: GMSK
Modulation type	: EGPRS: GMSK/8PSK WCDMA Band II/IV/V: QPSK
Support Bands	: LTE Band 2/4/5/7/12/13/17/41 LTE Band 2: 1850 ~ 1910 MHz LTE Band 4: 1710 ~ 1755 MHz
TX Frequency	: LTE Band 5: 824 ~ 849 MHz LTE Band 7: 2500 ~ 2570 MHz LTE Band 12: 699 ~ 715.9MHz LTE Band 41: 2496MHz ~ 2670MHz
Modulation type	: QPSK, 16QAM

2. Limits

The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposure				
0.3-3.0	614	1.63	*100	6
3.0-30	1842/f	4.89/f	*900/f ²	6
30-300	61.4	0.163	1.0	6
300-1,500			f/300	6
1,500-100,000			5	6
(B) Limits for General Population/Uncontrolled Exposure				
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

3. Test Procedure

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

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

R = distance to the centre of radiation of the antenna

4. Test lab information

Shenzhen Alpha Product Testing Co., Ltd

Building i, No.2, Lixin Road, Fuyong Street, Bao'an District, 518103, Shenzhen, Guangdong, China

June 21, 2018 File on Federal Communication Commission

Registration Number: 293961

July 15, 2019 Certificated by IC

Registration Number: 12135A

CAB identifier: CN0085

5. Result

Worse case is as below:

Mode	Frequency (MHz)	Prediction distance (cm)	RF output power		MPE (mW/cm ²)	Limit (mW/cm ²)
			dBm	mW		
EDR	2480	40	3.698	0.00234	0.00016	1
BLE	2480	40	0.673	0.00117	0.00008	1
2.4G WIFI	2462	40	14.737	0.02976	0.00197	1
5G WIFI B1	5240	40	13.664	0.02325	0.00154	1
5G WIFI B2	5270	40	12.747	0.01882	0.00125	1
5G WIFI B3	5670	40	12.868	0.01936	0.00128	1
5G WIFI B4	5785	40	13.289	0.02133	0.00141	1
GMS 850	836.6	40	28.05	0.63826	0.04484	0.5577
PCS1900	1880.0	40	29.94	0.98628	0.07425	1
WCDMA B5	836.4	40	21.64	0.14588	0.01025	0.5576
WCDMA B2	1852.4	40	21.55	0.14289	0.00797	1
WCDMA B4	1712.4	40	23.49	0.22336	0.01681	1
LET B2	1850.0	40	24.55	0.28510	0.02353	1
LTE B4	1710	40	24.88	0.30761	0.01717	1
LTE B5	824	40	24.57	0.28642	0.02012	0.5493
LTE B7	2500	40	24.40	0.27542	0.01848	1
LTE B12	699	40	24.57	0.28642	0.01562	0.4660
LTE B41	2496	40	24.37	0.27353	0.01814	1

Maximum Simultaneous transmission MPE Ratios for EDR.1+2.4G WIFI +GSM850:

Max MPE ratio BT4.1/Limit	Max MPE ratio 2.4G WIFI/Limit	Max MPE ratio PCS1900/Limit	ΣMPE ratios	Limit	Result
0.00016	0.00197	0.07425	0.07638	1	PASS

BT/WIFI Maximum Gain is 1.24dBi, 1.33(Numeric)

GSM 850: Maximum Gain is 1.5dBi, 1.41(Numeric)

PCS1900: Maximum Gain is 1.8dBi, 1.51(Numeric)

WCDMA Band V: Maximum Gain is 1.5dBi, 1.41(Numeric)

WCDMA Band IV: Maximum Gain is 0.5dBi, 1.12(Numeric)

WCDMA Band II: Maximum Gain is 1.8dBi, 1.51(Numeric)

LTE Band 2: Maximum Gain is 2.2dBi, 1.66(Numeric)

LTE Band 4: Maximum Gain is 0.5dBi, 1.12(Numeric)

LTE Band 5: Maximum Gain is 1.5dBi, 1.41(Numeric)

LTE Band 7: Maximum Gain is 1.3dBi, 1.35(Numeric)

LTE Band 41: Maximum Gain is 0.4dBi, 1.10(Numeric)

Therefore this device complies with FCC's RF radiation exposure limits for general population without SAR evaluation.