

Maximum Permissible Exposure Evaluation

FCC ID: 2A2GJ-M2808

1. Client Information

Applicant	:	Heltec Automation Technology Co., Ltd
Address	:	2-208, Block A, Yusha Building, 64 Hangtian Road, Longtan Industrial Park, Chenghua District, Chengdu, Sichuan, China
Manufacturer	:	Heltec Automation Technology Co., Ltd
Address	:	2-208, Block A, Yusha Building, 64 Hangtian Road, Longtan Industrial Park, Chenghua District, Chengdu, Sichuan, China

2. General Description of EUT

EUT Name	:	Heltec Indoor Hotspot
Models No.	:	HT-M2808, HT-M2802
Model Different	:	All these models are identical in the same PCB, layout and electrical circuit, The only difference is model name.
Sample ID	:	20210908-16-1#& 20210908-16-2#
Product Description	:	Operation Frequency: 802.11b/g/n(HT20): 2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz Bluetooth 5.0(BLE): 2402MHz~2480MHz Bluetooth 5.0(BER+EDR): 2402MHz~2480MHz U-NII-1: 5180MHz~5240MHz LoRa(500KHz): 923.3MHz-927.5MHz LoRa(125KHz): 902.3MHz-914.9MHz
Power Rating	:	Adapter: Input: 90-264V~, 50/60Hz, 1.5A Output: DC 12V3.0A
Software Version	:	N/A
Hardware Version	:	N/A
Remark	:	The adapter and antenna gain provided by the applicant, the verified for the RF conduction test provided by TOBY test lab.

Method Of Measurement for FCC

1. Max. Antenna Gain:

Internal Antenna: 5dBi.
External Antenna: 4dBi.

2. EUT Operation Condition:

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

3. Exposure Evaluation:

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

$$S=(PG)/4\pi R^2$$

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.

R: distance to the center of radiation of the antenna

Simultaneous transmission MPE Considerations

According to KDB447498: All transmitters and antennas in the host must be either evaluated for MPE compliance, by measurement or computational modeling, or qualify for the standalone MPE test exclusion in section 7.1. Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modeled or measured field strengths or power density, is ≤ 1.0 .

This means that:

$$\sum \text{ of MPE ratios } \leq 1.0$$

4. Test Result:

2.4G WiFi Worst Maximum MPE Result								
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
802.11b	1	2412	16.73	16±1	17	5	20	0.0315
		2437	16.62	16±1	17	5	20	0.0315
		2462	16.13	16±1	17	5	20	0.0315

Note:
 N_{TX}= Number of Transmit Antennas
 RF Output power specifies that Maximum Conducted Peak Output Power.

5G WiFi Worst Maximum MPE Result								
Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
802.11a	1	5180	10.95	10±1	11	5	20	0.0079
		5200	10.97	10±1	11	5	20	0.0079
		5240	9.87	10±1	11	5	20	0.0079

Note:
 N_{TX}= Number of Transmit Antennas
 RF Output power specifies that Maximum Conducted Peak Output Power.

Bluetooth Worst Maximum MPE Result

Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
GFSK	1	2402	4.82	4±1	5	5	20	0.0020
		2441	4.15	4±1	5	5	20	0.0020
		2480	3.24	4±1	5	5	20	0.0020

Note:

 N_{TX}= Number of Transmit Antennas

RF Output power specifies that Maximum Conducted Peak Output Power.

LoRa Worst Maximum MPE Result

Mode	N _{TX}	Freq. (MHz)	Conducted Power(max) (dBm)	Turn-up Power (dB)	Max tune up power (dBm) [P]	ANT Gain (dBi) [G]	Distance (cm) [R]	Power Density (mW/ cm ²) [S]
LoRa	1	902.3	17.478	17±1	18	4	20	0.0315
		908.5	17.124	17±1	18	4	20	0.0315
		914.9	16.664	17±1	18	4	20	0.0315

Note: RF Output power specifies that Maximum Conducted Peak Output Power.

5. Conclusion:

As specified in Table 1B of 47 CFR 1.1310- Limits for Maximum Permissible Exposure (MPE),

Limits for General Population/ Uncontrolled Exposure

Frequency Range (MHz)	Power density (mW/ cm ²)
300-1,500	F/1500
1,500-100,000	1.0

For: LoRa

Worst MPE limit S: 0.6026mW/ cm²

The MPE is calculated as **0.0315mW / cm² < limit 0.6026mW / cm²**.

For:2412~2462 MHz

MPE limit S: 1mW/ cm²

The MPE is calculated as **0.0315mW / cm² < limit 1mW / cm²**.

For:5180~5240MHz

MPE limit S: 1mW/ cm²

The MPE is calculated as **0.0079mW / cm² < limit 1mW / cm²**.

For:2402~2480MHz

MPE limit S: 1mW/ cm²

The MPE is calculated as **0.0020mW / cm² < limit 1mW / cm²**.

LoRa and WiFi support Synchronization transmit the

$$\sum \text{MPE}_{\text{ratios}} = 0.0315 + 0.0315 = 0.0630 < 1$$

So, RF exposure limit warning or SAR test are not required.

The EUT will only be used with a separation of 20cm or greater between the antenna and nearby persons and can therefore be considered a mobile transmitter per 47 CFR2.1091 (b). The RF Exposure Information page from the manual is included here for reference.

Note

For a more detailed features description, please refer to the RF Test Report.

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