

# 1. MAXIMUM PERMISSIBLE EXPOSURE (MPE)

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## 1.1 General Information

### Client Information

Applicant: Rachio, Inc.  
Address of applicant: 1400 16th Street, Suite 400, Denver, Colorado, 80202

Manufacturer: Rachio, Inc.  
Address of manufacturer: 1400 16th Street, Suite 400, Denver, Colorado, 80202

### General Description of EUT:

Product Name: R3 USI  
Trade Name: /  
Model No.: 16ZULWCUSI  
Adding Model(s): 4ZULWCUSI, 6ZULWCUSI, 8ZULWCUSI, 12ZULWCUSI, 8ZULWCUSI-PS, 16ZULWCUSI-PS  
Rated Voltage: 24VAC  
MODEL: Number: ILA48-241000  
Power Adapter Model: INPUT: AC120V, 60Hz 300mA MAX  
OUTPUT: 24VAC, 1000mA  
FCC ID: 2AOTB-ZULWCUSI  
Equipment Type: Mobile Device

### Technical Characteristics of EUT:

#### Wi-Fi (2.4GHz)

Support Standards: 802.11b, 802.11g, 802.11n  
Frequency Range: 2412-2462MHz for 802.11b/g/n(HT20)  
RF Output Power: 16.04dBm (Conducted)  
Type of Modulation: DBPSK, BPSK, DQPSK, QPSK, 16QAM, 64QAM  
Quantity of Channels: 11 for 802.11b/g/n(HT20)  
Channel Separation: 5MHz  
Type of Antenna: PCB Antenna  
Antenna Gain: 1.2dBi

#### Wi-Fi (5GHz)

Support Standards: 802.11a, 802.11n(HT20) , 802.11n-HT40  
Frequency Range: 5150-5250MHz, 5250-5350MHz, 5470-5725MHz, 5725-5850MHz  
RF Output Power: 8.93dBm (Conducted)  
Type of Modulation: BPSK, QPSK, 16QAM, 64QAM  
Type of Antenna: PCB Antenna  
Antenna Gain: 1.2dBi

## 1.2 MPE Exemption

**FCC Rule Part 1.1307 (b)(3)(i)(A):** The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

**FCC Rule Part 1.1307 (b)(3)(i)(B):** the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold  $P_{th}$  (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive).  $P_{th}$  is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left( \frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz};$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

$d$  = the separation distance (cm);

**FCC Rule Part 1.1307 (b)(3)(i)(C):** The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least  $\lambda/2\pi$ , where  $\lambda$  is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation	
RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1,920 R^2$
1.34-30	$3,450 R^2/f^2$
30-300	$3.83 R^2$
300-1,500	$0.0128 R^2 f$
1,500-100,000	$19.2 R^2$

### 1.3 MPE Calculation Result

For Wi-Fi (2.4GHz):

Maximum output power: 16.04 (dBm)

Maximum Tune-Up output power: 17.0 (dBm)

Prediction distance: >20(cm)

Prediction frequency: 2412 (MHz)

Antenna gain: 1.2 (dBi)

For Wi-Fi (5GHz):

Maximum output power: 8.93 (dBm)

Maximum Tune-Up output power: 9.0(dBm)

Prediction distance: >20(cm)

Prediction frequency: 5670(MHz)

Antenna gain: 1.2(dBi)

#### MPE Exemption Option C

Frequency (MHz)	$\lambda/2\pi$ (m)	R (m)	Tune-Up ERP (dBm)	Tune-Up ERP (W)	Threshold ERP (W)	Result Pass/Fail
2412	0.01980	0.2	16.05	0.0403	0.7680	Pass
5670	0.00842	0.2	8.05	0.0064	0.7680	Pass

Note: ERP=EIRP-2.15; EIRP= Output Power + Antenna gain

Result: Pass