

## RF EXPOSURE EVALUATION

### Maximal Permissible Exposure [MPE]

**Applicant Name:**

Allerio Inc.  
11 E. Superior St, Suite 548  
Duluth, MN 55802  
USA

**Date of Testing:**

04/22 - 05/19/2020

**Test Site/Location:**

PCTEST Lab. Columbia, MD, USA

**Test Report Serial No.:**

1M2004020055-05.2AV6O

**FCC ID:**

**2AV6O-AMH100**

**APPLICANT:**

**Allerio Inc.**

**EUT Type:**

Mobile Hub

**FCC Classifications:**

Digital Transmission System (DTS)

Spread Spectrum Transmitter (DSS)

**FCC Rule Part:**


FCC Part 1 (§1.1310) and Part 2 (§2.1091)

**Test Procedure(s):**

KDB 447498 D01



This equipment has been shown to be capable of compliance with the applicable technical standards as indicated in the measurement report and was tested in accordance with the measurement procedures specified in FCC KDB 447498 D01. Test results reported herein relate only to the item(s) tested.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them.



Randy Ortanez  
President






<b>FCC ID:</b> 2AV6O-AMH100		<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2004020055-05.2AV6O	<b>Test Dates:</b> 04/22 - 05/19/2020	<b>EUT Type:</b> Mobile Hub		Page 1 of 6

## T A B L E   O F   C O N T E N T S

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1.0	RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE) .....	3
1.1	Introduction .....	3
1.2	EUT Description.....	3
1.3	Procedure .....	4
2.0	CONCLUSION .....	6

FCC ID: 2AV6O-AMH100	 <b>PCTEST</b> <sup>®</sup> Proud to be part of 	<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>	 <b>Allerio</b> <sup>™</sup>	<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2004020055-05.2AV6O	<b>Test Dates:</b> 04/22 - 05/19/2020	<b>EUT Type:</b> Mobile Hub	Page 2 of 6	

## 1.0 RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)

### 1.1 Introduction

This document is prepared to show compliance with the RF Exposure requirements as required in §1.1310 of the FCC Rules and Regulations and RSS-102 of Industry Canada.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310 and RSS-102: the criteria listed in the following table shall be used to evaluate the environmental 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 <sup>2</sup> )	Average Time (Minutes)
(A) Limits For Occupational / Control Exposures (f = frequency)				
30-300	61.4	0.163	1.0	6
300-1500	...	...	f/300	6
1500-100,000	...	...	5.0	6
(B) Limits For General Population / Uncontrolled Exposure (f = frequency)				
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

**Table 1-1. Limits for Maximum Permissible Exposure (MPE)**




### 1.2 EUT Description

The **Allerio Mobile Hub FCC ID: 2AV6O-AMH100** is a device containing a chipset supporting 2.4GHz WLAN (802.11b/g/n) and Bluetooth capabilities. This device also contains four integrated previously FCC approved modules:

1. JJPlus 2.4/5GHz WiFi module, FCC ID: W23-WMU62XX
2. Sierra Wireless LTE module, FCC ID: N7NEM75S (x1)
3. Sierra Wireless LTE module, FCC ID: N7NEM7455 (x2)

The device can operate where two modules can operate simultaneously and where the JJPlus module is always one of the modules. That is, the viable combinations are JJPlus + AMH100 (BT/WiFi), JJPlus + Sierra EM7511, JJPlus + Sierra EM7455 #1, and JJPlus + Sierra EM7455 #2. The RF exposure for all of these combinations of modules are addressed in this report.

For RF Exposure, this device is evaluated to the Mobile Device requirements and is considered a device to be used by the General Population/Uncontrolled Exposure.

FCC ID: 2AV6O-AMH100	 <b>PCTEST</b> Proud to be part of 	<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2004020055-05.2AV6O	<b>Test Dates:</b> 04/22 - 05/19/2020	<b>EUT Type:</b> Mobile Hub	Page 3 of 6	

### 1.3 Procedure

The procedure used to determine the RF power density was based upon a calculation for determining compliance with the MPE requirements. The power generated by each transmitter used in this product was initially measured by a spectrum analyzer and the powers were recorded. Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at a distance of 20cm.

#### Friis Transmission Formula

Friis transmission formula:  $P_d = (P_{out} * G) / (4\pi r^2)$

Where,

$P_d$  = Power Density (mW/cm<sup>2</sup>)

$\pi$  = 3.1416

$P_{out}$  = output power to antenna (mW)

$r$  = distance between observation point and center of the radiator (cm)

$G$  = gain of antenna in linear scale

#### Calculated MPE

The power density limit for General Population/Uncontrolled Exposure at each frequency is determined based on the information in Table 1-1. There is no co-location between the electric fields of any two transmitters therefore following power densities are calculated for each individual transmitter by frequency at 20cm spacing:




#### RF Exposure for AMH100 Bluetooth/WiFi Transmission

Frequency	2402 MHz		
Limit	1.000 mW/cm <sup>2</sup>		
Distance (cm), R =	20 cm		
Power (dBm), P =	12.22 dBm	16.67 mW	
TX Ant Gain (dBi), G =	1.25 dBi		
Power Density (S) =	0.0044 mW/cm <sup>2</sup>	(at 20cm)	
Minimum Distance =	1.3 cm		

Table 1-2. Calculated MPE Data for Bluetooth Band

Frequency:	2462 MHz		
Limit:	1.000 mW/cm <sup>2</sup>		
Distance (cm), R =	20 cm		
Power (dBm), P =	13.23 dBm	21.04 mW	
TX Ant Gain (dBi), G =	1.25 dBi		
Power Density (S) =	0.0056 mW/cm <sup>2</sup>	(at 20cm)	
Minimum Distance =	1.5 cm		

Table 1-3. Calculated MPE Data for 2.4GHz WiFi Band

FCC ID: 2AV6O-AMH100	 <b>PCTEST</b> Proud to be part of 	MAXIMUM PERMISSIBLE EXPOSURE REPORT	 <b>Allerio</b>	Approved by: Quality Manager
Test Report S/N: 1M2004020055-05.2AV6O	Test Dates: 04/22 - 05/19/2020	EUT Type: Mobile Hub		Page 4 of 6

## RF Exposure for Simultaneous Transmissions Scenarios

	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Percent MPE Used (%)
Tx #1 - JJPlus 2.4GHz WiFi	0.3046	1.000	30.46
Tx #2 - 2.4GHz WiFi	0.0056	1.000	0.56
Total			31.02

Table 1-4. MPE Data for JJPlus 2.4GHz WiFi + AMH100 2.4GHz WiFi




	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Percent MPE Used (%)
Tx #1 - JJPlus 2.4GHz WiFi	0.3046	1.000	30.46
Tx #2 - Sierra EM7511	0.1989	0.466	42.69
Total			73.15

Table 1-5. MPE Data for JJPlus 2.4GHz WiFi + Sierra EM7511 LTE (FirstNet)

	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )	Percent MPE Used (%)
Tx #1 - JJPlus 2.4GHz WiFi	0.3046	1.000	30.46
Tx #2 - Sierra EM7455	0.1989	0.466	42.69
Total			73.15




Table 1-6. MPE Data for JJPlus 2.4GHz WiFi + Sierra EM7455 LTE (Verizon/TMO)

**Note:** The MPE data for the Sierra Wireless modules and the JJPlus module were taken from the filings for those FCC ID's

FCC ID: 2AV6O-AMH100	 <b>PCTEST</b> Proud to be part of 	MAXIMUM PERMISSIBLE EXPOSURE REPORT	 <b>Allerio</b>	Approved by: Quality Manager
Test Report S/N: 1M2004020055-05.2AV6O	Test Dates: 04/22 - 05/19/2020	EUT Type: Mobile Hub		Page 5 of 6

## 2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 20cm separation distance as specified in §2.1091 of the FCC Rules and Regulations and Health Canada Safety Code 6. An appropriate RF exposure compliance statement will be placed in the user's manual.

<b>FCC ID:</b> 2AV6O-AMH100	 <b>PCTEST</b> Proud to be part of 	<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>		<b>Approved by:</b> Quality Manager
<b>Test Report S/N:</b> 1M2004020055-05.2AV6O	<b>Test Dates:</b> 04/22 - 05/19/2020	<b>EUT Type:</b> Mobile Hub		Page 6 of 6