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Intertek  
731 Enterprise Drive  
Lexington, KY 40510

Tel 859 226 1000  
Fax 859 226 1040

[www.intertek.com](http://www.intertek.com)

# Ubicquia, Inc. MPE REPORT

## SCOPE OF WORK

MPE CALCULATION  
ON THE UBIHUB APAI

## REPORT NUMBER

104626259LEX-010.1

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10/20/2021

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## MPE TEST REPORT

**Report Number:** 104626259LEX-010.1

**Project Number:** G104626259

**Report Issue Date:** 12/17/2021

**Product Name:** UbiHub APAI

**Standards:** FCC Part 1.1310 Limits for Maximum  
Permissible Exposure (MPE)

**RSS-102 Issue 5 RF Field Strength Limits for  
Devices Used by the General Public**

**Tested by:**  
Intertek Testing Services NA, Inc.  
731 Enterprise Drive  
Lexington, KY 40510  
USA

**Client:**  
Ubicquia, Inc.  
401 Eas Las Olas Blvd.  
Suite 1750  
Fort Lauderdale, FL 33301  
USA

Report prepared by



Bryan Taylor, Team Leader

Report reviewed by



Brian Lackey, Staff Engineer

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## 1 Introduction and Conclusion

The tests indicated in section 2.0 were performed on the product constructed as described in section 4.0. The remaining test sections are the verbatim text from the actual data sheets used during the investigation. These test sections include the test name, the specified test Method, a list of the actual Test Equipment Used, documentation Photos, Results and raw Data. No additions, deviations, or exclusions have been made from the standard(s) unless specifically noted.

Based on the results of our investigation, we have concluded the product tested **complies** with the requirements of the standard(s) indicated. The results obtained in this test report pertain only to the item(s) tested. Intertek does not make any claims of compliance for samples or variants which were not tested.

## 2 Test Summary

Section	Test full name	Result
9	FCC Part 1.1310 Limits for Maximum Permissible Exposure (MPE) (Limits for General Population / Uncontrolled Exposure)	Pass
	RSS-102 Issue 5 RF Field Strength Limits (For Devices Used by the General Public)	Pass



### 3 Client Information

This product was tested at the request of the following:

Client Information	
<b>Client Name:</b>	Ubicquia, Inc.
<b>Address:</b>	401 Eas Las Olas Blvd. Suite 1750 Fort Lauderdale, FL 33301 USA
<b>Contact:</b>	Shimon Goldstein
<b>Telephone:</b>	(954) 774-6213
<b>Email:</b>	sgoldstein@ubicquia.com
Manufacturer Information	
<b>Manufacturer Name:</b>	Ubicquia, Inc.
<b>Manufacturer Address:</b>	401 Eas Las Olas Blvd. Suite 1750 Fort Lauderdale, FL 33301 USA

**4 Description of Equipment under Test and Variant Models**

Equipment Under Test		
<b>Product Name</b>	UbiHub APAI	
<b>Model Number</b>	UBH-H-AI	
<b>Serial Number</b>	Test Sample 1	
<b>Receive Date</b>	6/1/2021	
<b>Test Start Date</b>	6/2/2021	
<b>Test End Date</b>	9/10/2021	
Transmit Bands and Maximum Output Power	Transmit Bands	Output Power
	2402 – 2480MHz (Bluetooth)	3.4dBm (taken from module MPE exhibit)
	2412 – 2462MHz (2.4GHz WiFi)	26.69dBm
	5150 – 5250MHz (U-NII 1)	22.02dBm
	5725 – 5825MHz (U-NII 3)	22.3dBm (taken from measured data)
<b>EP06-A Module:</b> LTE Bands 2, 4, 5, 7, 12, 13, 25, 26, 29, 30, 66	24.00dBm (taken from module MPE exhibit)	
<b>EG25-G Module:</b> LTE Bands 1, 2, 3, 4, 5, 7, 8, 12, 13, 18, 19, 20, 25, 26, 28, 38, 39, 40, 41	25.00dBm (taken from module specifications)	
<b>Modulation Types Supported</b>	Bluetooth 802.11b, 802.11g, 802.11n, 802.11ac, 802.11ax LTE	
<b>Device Received Condition</b>	Good	
<b>Test Sample Type</b>	Production	
<b>Ratings</b>	90 – 504VAC, 50/60Hz, 95W	
Description of Equipment Under Test (provided by client)		
UbiHub is a smart streetlight controller with support for WiFi6 (802.11ax) 5Ghz 8x8 configuration, as well as 2.4Ghz 4x4 configuration, and LTE backhaul (via pre-approved LTE Module: EG25-G or EP06-A).		



#### 4.1 Variant Models:

UbiHub is a smart streetlight controller with two versions (with and without optional AI plug in daughterboard). Both versions have the same AP and enable lighting controls and high-speed internet access. The APAI model version additionally provides AI analysis for street traffic.

- The UbiHub Family of products supports 2 different Model Names: UbiHub APAI and UbiHub AP6
- **AP6:** The AP6 Model (UBH-H-WI) supports full WiFi6 (802.11ax) 5Ghz 8x8 configuration, as well as 2.4Ghz 4x4 configuration, and LTE backhaul (via LTE Module: EG25-G or EP06-A).
- **APAI:** The APAI Model (UBH-H-AI) supports identical AP6 functionality (hardware and software), but in addition supports audio/video street traffic analytics via an AI plug-in daughterboard.

All testing in this report was performed on the APAI version since it is more densely populated than the AP6 version. The differences between the AP6 and APAI versions are only in non-transmitter related circuitry so the results within this report should also apply to the AP6 version.



## 5 Antenna Gains:

The antenna gains used for the approved transmitter modules onboard were provided by the manufacturer (via the antenna data sheets) and could affect compliance:

Bluetooth Antenna:	ProAnt InSide 2400	
	2400 – 2500MHz	3dBi
LTE Antenna:	Taoglas FXUB64.18.0150A	
	617 – 960MHz	3.5dBi
	1575.42MHz	4.5dBi
	1710 – 1990MHz	6.0dBi
	1755 – 2170MHz	6.0dBi
	2400 – 2500MHz	3.7dBi
	2500 – 2690MHz	2.3dBi
2.4GHz WiFi	Taoglas FXP522.A.07.A.001	
	2412 – 2462MHz	8.52dBi
5GHz WiFi Bands	Taoglas FXP524.D.07.C.001	
	5180 – 5745MHz	13.6dBi

## 6 FCC Limits

**§ 1.1310:** The criteria listed in table 1 shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in §1.1307(b), except in the case of portable devices which shall be evaluated according to the provisions of §2.1093 of this chapter.

### Part 1.1310 Limits for Maximum Permissible Exposure (MPE)





Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm <sup>2</sup> )	Averaging time (minutes)
<b>(A) Limits for Occupational/Controlled Exposures</b>				
0.3–3.0	614	1.63	*(100)	6
3.0–30	1842/f	4.89/f	*(900/f <sup>2</sup> )	6
30–300	61.4	0.163	1.0	6
300–1500			f/300	6
1500–100,000			5	6
<b>(B) Limits for General Population/Uncontrolled Exposure</b>				
0.3–1.34	614	1.63	*(100)	30
1.34–30	824/f	2.19/f	*(180/f <sup>2</sup> )	30
30–300	27.5	0.073	0.2	30
300–1500			f/1500	30
1500–100,000			1.0	30

f = frequency in MHz

\* = Plane-wave equivalent power density

NOTE 1 TO TABLE 1: Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

NOTE 2 TO TABLE 1: General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

## 7 RSS-102 Issue 5 Exposure Limits:

**Table 4: RF Field Strength Limits for Devices Used by the General Public (Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m <sup>2</sup> )	Reference Period (minutes)
0.003-10 <sup>21</sup>	83	90	-	Instantaneous*
0.1-10	-	0.73/ f	-	6**
1.1-10	87/ f <sup>0.5</sup>	-	-	6**
10-20	27.46	0.0728	-2	6
20-48	58.07/ f <sup>0.25</sup>	0.1540/ f <sup>0.25</sup>	8.944/ f <sup>0.5</sup>	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 f <sup>0.3417</sup>	0.008335 f <sup>0.3417</sup>	0.02619 f <sup>0.6834</sup>	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ f <sup>1.2</sup>
150000-300000	0.158 f <sup>0.5</sup>	4.21 x 10 <sup>-4</sup> f <sup>0.5</sup>	6.67 x 10 <sup>-5</sup> f	616000/f <sup>1.2</sup>

Note: f is frequency in MHz.  
 \* Based on nerve stimulation (NS).  
 \*\* Based on specific absorption rate (SAR).



## 8 Test Procedure

An MPE evaluation was performed in order to show that the device was compliant with the general population exposure limits from FCC §2.1091 and RSS-102 Issue 5. The maximum power density was calculated for each transmitter band. The separation distance was adjusted so that in the worst case transmit mode(s) the power density was just below the required limit. This separation distance is called out in the results that follow.

For each transmitter the maximum RF exposure at a “d” cm distance using the formula:

$$\text{Conducted Power}_{mW} = 10^{\text{Conducted Power (dBm)}/10}$$

$$\text{Power Density} = \frac{\text{Conducted Power}_{mW} \times \text{Ant. Gain}}{4\pi \times (d(\text{cm}))^2}$$

For transmitters that could operate simultaneously, the MPE to limit ratio for each was calculated and then summed. If the sum of the MPE to limit ratios was less than 1, that specific combination of transmitters was deemed to comply.



**9 Results:**

The calculated maximum power density was equal to or less than the required limits for general population exposure for FCC Part 1.1310 and RSS-102 Issue 5. The worse case operating mode was with Bluetooth, 2.4GHz WiFi, all four bands of 5GHz WiFi, and a single LTE band from either the EP06-A or EG25G module all transmitting simultaneously.

In this worst-case mode, a separation distance of 40cm results in power density values below the applicable FCC and RSS-102 limits and a sum of the MPE / Limit ratios of less than 1. The 40cm separation distance was chosen for the power density calculation as that allowed the simultaneous transmission configuration to have a power density below both the FCC and the ISSED limit.

**FCC MPE Data**

Duty Cycle	100 (%)							
Separation Dist.	40 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )	Margin to Limit (mW/cm <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)
2.4GHz WiFi	2412	26.69	26.69	8.52	0.1651	1.0000	0.8349	0.1651
UNII-1 WiFi	5180	22.02	22.02	13.6	0.1814	1.0000	0.8186	0.1814
UNII-3 WiFi	5745	22.3	22.30	13.6	0.1935	1.0000	0.8065	0.1935
<b>MDBT42Q-U Bluetooth Module</b>								
Bluetooth	2402	3.4	3.40	3	0.0002	1.0000	0.9998	0.0002
<b>EP06-A LTE Module</b>								
LTE Band 2	1850	24	24.00	6	0.0497	1.0000	0.9503	0.0497
LTE Band 4	1710	24	24.00	6	0.0497	1.0000	0.9503	0.0497
LTE Band 5	824	24	24.00	3.5	0.0280	0.5493	0.5214	0.0509
LTE Band 7	2500	24	24.00	3.7	0.0293	1.0000	0.9707	0.0293
LTE Band 12	699	24	24.00	3.5	0.0280	0.4660	0.4380	0.0600
LTE Band 13	777	24	24.00	3.5	0.0280	0.5180	0.4900	0.0540
LTE Band 25	1850	24	24.00	6	0.0497	1.0000	0.9503	0.0497
LTE Band 26	814	24	24.00	3.5	0.0280	0.5427	0.5147	0.0515
LTE Band 29	717	24	24.00	3.5	0.0280	0.4780	0.4500	0.0585
LTE Band 30	2350	24	24.00	6	0.0497	1.0000	0.9503	0.0497
LTE Band 66	1710	24	24.00	6	0.0497	1.0000	0.9503	0.0497
<b>EG25-G LTE Module</b>								
LTE Band 2	1850	25	25.00	6	0.0626	1.0000	0.9374	0.0626
LTE Band 4	1710	25	25.00	6	0.0626	1.0000	0.9374	0.0626
LTE Band 5	824	25	25.00	3.5	0.0352	0.5493	0.5141	0.0641
LTE Band 7	2500	25	25.00	3.7	0.0369	1.0000	0.9631	0.0369
LTE Band 12	699	25	25.00	3.5	0.0352	0.4660	0.4308	0.0756
LTE Band 13	777	25	25.00	3.5	0.0352	0.5180	0.4828	0.0680
LTE Band 25	1850	25	25.00	6	0.0626	1.0000	0.9374	0.0626
LTE Band 26	814	25	25.00	3.5	0.0352	0.5427	0.5075	0.0649
LTE Band 38	2570	25	25.00	2.3	0.0267	1.0000	0.9733	0.0267
LTE Band 41	2496	25	25.00	3.7	0.0369	1.0000	0.9631	0.0369
							2.4GHz WiFi	0.1651
							UNII-1 WiFi	0.1814
							UNII-3 WiFi	0.1935
							Bluetooth	0.0002
							LTE Band 12	0.0756
							<b>MPE / Limit Sum</b>	<b>0.6158</b>



**RSS-102 Issue 5 MPE Data**

Duty Cycle	100 (%)							
Separation Dist.	40 (cm)							
Operating Mode	Frequency (MHz)	Declared Max Cond. Power (Inc. Tolerance) (dBm)	Duty Cycle Adjusted Cond. Output Power (dBm)	Antenna Gain (dB)	MPE Value (W/m <sup>2</sup> )	MPE Limit (W/m <sup>2</sup> )	Margin to Limit (W/m <sup>2</sup> )	MPE / Limit Ratio (for Co-Location)
2.4GHz WiFi	2412	26.69	26.69	8.52	1.6507	5.3660	3.7153	0.3076
UNII-1 WiFi	5180	22.02	22.02	13.6	1.8141	9.0471	7.2329	0.2005
UNII-3 WiFi	5745	22.3	22.30	13.6	1.9350	9.7103	7.7754	0.1993
<b>MDBT42Q-U Bluetooth Module</b>								
Bluetooth	2402	3.4	3.40	3	0.0022	5.3508	5.3486	0.0004
<b>EP06-A LTE Module</b>								
LTE Band 2	1850	24	24.00	6	0.4974	4.4763	3.9790	0.1111
LTE Band 4	1710	24	24.00	6	0.4974	4.2419	3.7446	0.1172
LTE Band 5	824	24	24.00	3.5	0.2797	2.5756	2.2959	0.1086
LTE Band 7	2500	24	24.00	3.7	0.2929	5.4991	5.2062	0.0533
LTE Band 12	699	24	24.00	3.5	0.2797	2.3017	2.0220	0.1215
LTE Band 13	777	24	24.00	3.5	0.2797	2.4743	2.1946	0.1130
LTE Band 25	1850	24	24.00	6	0.4974	4.4763	3.9790	0.1111
LTE Band 26	814	24	24.00	3.5	0.2797	2.5542	2.2745	0.1095
LTE Band 29	717	24	24.00	3.5	0.2797	2.3421	2.0624	0.1194
LTE Band 30	2350	24	24.00	6	0.4974	5.2714	4.7740	0.0944
LTE Band 66	1710	24	24.00	6	0.4974	4.2419	3.7446	0.1172
<b>EG25-G LTE Module</b>								
LTE Band 2	1850	25	25.00	6	0.6261	4.4763	3.8502	0.1399
LTE Band 4	1710	25	25.00	6	0.6261	4.2419	3.6158	0.1476
LTE Band 5	824	25	25.00	3.5	0.3521	2.5756	2.2235	0.1367
LTE Band 7	2500	25	25.00	3.7	0.3687	5.4991	5.1304	0.0670
LTE Band 12	699	25	25.00	3.5	0.3521	2.3017	1.9496	0.1530
LTE Band 13	777	25	25.00	3.5	0.3521	2.4743	2.1222	0.1423
LTE Band 25	1850	25	25.00	6	0.6261	4.4763	3.8502	0.1399
LTE Band 26	814	25	25.00	3.5	0.3521	2.5542	2.2021	0.1379
LTE Band 38	2570	25	25.00	2.3	0.2671	5.6038	5.3367	0.0477
LTE Band 41	2496	25	25.00	3.7	0.3687	5.4930	5.1243	0.0671
							2.4GHz WiFi	0.3076
							UNII-1 WiFi	0.2005
							UNII-3 WiFi	0.1993
							Bluetooth	0.0004
							LTE Band 12	0.1530
							<b>MPE / Limit Sum</b>	<b>0.8608</b>



## 10 Revision History

Revision Level	Date	Report Number	Prepared By	Reviewed By	Notes
0	10/20/2021	104626259LEX-010	BCT	BZ	Original Issue
1	12/17/2021	104626259LEX-010.1	BCT	BZ	Removed the DFS bands.