



RF EXPOSURE EVALUATION

Maximal Permissible Exposure [MPE]

Applicant Name:

Pivotal Commware
10801 120th Ave NE #200,
Kirkland, WA 98033
United States

Date of Testing:

10/7/2019-11/27/2019

Test Site/Location:

PCTEST Lab. Columbia, MD, USA

Test Report Serial No.:

1M1909170154-08.2AUVU

FCC ID:
2AUVU-UBR410M
APPLICANT:
Pivotal Commware
Application Type:

Class II Permissive Change

Model:

UBR410M

EUT Type:

Multi-Band Cat. M1 LTE Module

FCC Classification:

PCS Licensed Transmitter (PCB)

FCC Rule Parts:

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

Test Procedure(s):

KDB 447498 D01 v06

Class II Permissive Change:

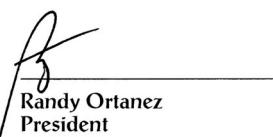
Please see C2PC Cover Letter

Original Grant Date:

12/16/2019

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 v06. 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



FCC ID: 2AUVU-UBR410M	 PCTEST ENGINEERING LABORATORY, INC.		MAXIMUM PERMISSIBLE EXPOSURE REPORT	PIVOTAL COMMWARE	Approved by: Quality Manager
Test Report S/N: 1M1909170154-08.2AUVU	Test Dates: 10/7/2019-11/27/2019	EUT Type: 5G mmWave Repeater			Page 1 of 5

T A B L E O F C O N T E N T S

1.0	RF EXPOSURE EVALUATION – MAXIMUM PERMISSIBLE EXPOSURE (MPE)	3
1.1	Introduction	3
1.2	EUT Description.....	3
1.3	Procedure	3
2.0	CONCLUSION	5

FCC ID: 2AUVU-UBR410M	 PCTEST® <small>ENGINEERING LABORATORY, INC.</small>	MAXIMUM PERMISSIBLE EXPOSURE REPORT	 PIVOTAL® <small>COMMWARE</small>
Test Report S/N: 1M1909170154-08.2AUVU	Test Dates: 10/7/2019-11/27/2019	EUT Type: 5G mmWave Repeater	Approved by: Quality Manager Page 2 of 5

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.

The limit for Maximum Permissible Exposure (MPE), specified in FCC §1.1310, is listed in Table 1-1. According to FCC §1.1310: 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 ²)	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 **Pivotal Commware FCC ID: 2AUVU-UBR410M** is a Cat. M1 LTE module that is integrated into a previously FCC certified bidirectional 5G mmWave Repeater host device (FCC ID: 2AUVU-OES3). For this MPE evaluation, the device is treated as a mobile device and evaluated as such per the requirements of FCC 2.1091 and KDB 447498 D01.

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 radiated power (EIRP) generated by 5G mmWave antennas are measured for both the horizontal and vertical components using a spectrum analyzer. The LTE, WiFi, Bluetooth, and BLE powers used for the MPE evaluation were taken from the power levels shown on the respective Grants of Authorization.

Through use of the Friis transmission formula and knowledge of the maximum antenna gain to be used, the power density level is calculated at the minimum distance required to show compliance to the MPE limit.

FCC ID: 2AUVU-UBR410M		MAXIMUM PERMISSIBLE EXPOSURE REPORT		Approved by: Quality Manager
Test Report S/N: 1M1909170154-08.2AUVU	Test Dates: 10/7/2019-11/27/2019	EUT Type: 5G mmWave Repeater		Page 3 of 5

Friis Transmission Formula

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

Where,

P_d = Power Density (mW/cm²)

$\pi = 3.1416$

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

HBF Side (HBF Horizontal + HBF Vertical + LTE + BT + WiFi)							
Radio	Frequency (GHz)	Target Conducted Output Power (dBm)	Antenna Gain (dBi)	Maximum EIRP (dBm)	Measurement Distance (cm)	Calculated MPE (mW/cm ²)	MPE Limit (mW/cm ²)
HBF Horizontal	27.55-28.35	10	17	29.11	20	0.162	1.0
HBF Vertical	27.55-28.35	10	17	28.3	20	0.135	1.0
WiFi	2.4	18.72	1	19.72	20	0.019	1.0
LTE	0.777 - 0.787	25	1.6	26.6	20	0.091	0.518
BT	2.4	12.38	1	13.38	20	0.004	1.0
BLE	2.4	10	1	11	20	0.003	1.0
					Total:	0.498	1.0

Table 1-2. Calculated MPE Data for Simultaneous Transmissions with the HBF Antenna

Patch Side (Patch Horizontal + Patch Vertical + LTE + BT + WiFi)							
Radio	Frequency (GHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	Tolerance Maximum Power (dBm)	Measurement Distance (cm)	Calculated MPE (mW/cm ²)	MPE Limit (mW/cm ²)
Patch/OEWG Horizontal	27.5-28.35	20	6	29.42	20	0.174	1.0
Patch/OEWG Vertical	27.5-28.35	20	6	29.47	20	0.176	1.0
WiFi	2.4	18.72	1	19.72	20	0.019	1.0
LTE	0.777 - 0.787	25	1.6	26.6	20	0.091	0.518
BT	2.4	12.38	1	13.38	20	0.004	1.0
BLE	2.4	10	1	11	20	0.003	1.0
					Total:	0.551	1.0

Table 1-3. Calculated MPE Data for Simultaneous Transmissions with the Patch Antenna

FCC ID: 2AUVU-UBR410M		MAXIMUM PERMISSIBLE EXPOSURE REPORT				Approved by: Quality Manager
Test Report S/N: 1M1909170154-08.2AUVU	Test Dates: 10/7/2019-11/27/2019	EUT Type: 5G mmWave Repeater				Page 4 of 5

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. An appropriate RF exposure compliance statement will be placed in the user's manual.

FCC ID: 2AUVU-UBR410M	 PCTEST® ENGINEERING LABORATORY, INC.	MAXIMUM PERMISSIBLE EXPOSURE REPORT		 PIVOTAL® COMMWARE	Approved by: Quality Manager
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