



## RF EXPOSURE EVALUATION

### Maximum Permissible Exposure [MPE]

**Applicant Name:**  
Pivotal Commware  
10801 120th Ave NE #200,  
Kirkland, WA 98033  
United States


**Date of Testing:**  
9/17/2020-10/16/2020  
**Test Site/Location:**  
PCTEST Lab. Columbia, MD, USA  
**Test Report Serial No.:**  
1M2008040118-05.2AUVU

<b>FCC ID:</b>	<b>2AUVU-P28DUGA1</b>
<b>APPLICANT:</b>	<b>Pivotal Commware</b>




**Application Type:** Certification  
**Model:** PIV28DUGA1  
**EUT Type:** 5G mmWave Repeater (Donor Unit)  
**FCC Classifications:** Part 20 Industrial Booster (CMRS) (B2I),  
Part 30 Transportable Transmitter (5GT)  
**FCC Rule Parts:** FCC Part 1 (§1.1310) and Part 2 (§2.1091)  
**Test Procedure(s):** KDB 447498 D01 v06

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



<b>FCC ID:</b> 2AUVU-P28DUGA1	 <b>PCTEST</b> Proud to be part of  element	<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>	 <b>PIVOTAL</b> COMMWARE	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2008040118-05.2AUVU	<b>Test Dates:</b> 9/17/2020-10/16/2020	<b>EUT Type:</b> 5G mmWave Repeater (Donor Unit)	Page 1 of 5	




© 2020 PCTEST

V1.0

All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact [INFO@PCTEST.COM](mailto:INFO@PCTEST.COM).

## 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 .....	4
2.0	CONCLUSION .....	5

FCC ID: 2AUVU-P28DUGA1	 <b>PCTEST</b> Proud to be part of  element	<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>	 <b>PIVOTAL</b> COMMWARE	<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2008040118-05.2AUVU	<b>Test Dates:</b> 9/17/2020-10/16/2020	<b>EUT Type:</b> 5G mmWave Repeater (Donor Unit)	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 <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 **Pivotal Commware FCC ID: 2AUVU-P28DUGA1** is a bidirectional 5G mmWave Repeater (Donor Unit) that will be installed on a post as part of a system with a Service Unit. The unit has a Holographic Beamforming antenna facing towards a 5G base station. The HBF has horizontal and vertical components which transmit simultaneously. The EUT supports any combination of bandwidths, number of carriers, and modulations as input signals. It will transmit all signals within the 5G n261 band that are received.

This unit also comes equipped with an LTE module (FCC ID: 2AUVU-UBR410M) and a 2.4GHz WiFi module (FCC ID: Z64-WL18SBMOD) used for other purposes. 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.

FCC ID: 2AUVU-P28DUGA1		MAXIMUM PERMISSIBLE EXPOSURE REPORT		Approved by: Technical Manager
Test Report S/N: 1M2008040118-05.2AUVU	Test Dates: 9/17/2020-10/16/2020	EUT Type: 5G mmWave Repeater (Donor Unit)	Page 3 of 5	

### 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 and WiFi 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.

#### 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.



DU (Horizontal-UL + Vertical-UL+ LTE +WiFi)								
Radio	Frequency (GHz)	Target Conducted Output Power (dBm)	Antenna Gain (dBi)	Tolerance (dB)	Maximum EIRP (dBm)	Measurement Distance (cm)	Calculated MPE (mW/cm <sup>2</sup> )	MPE Limit (mW/cm <sup>2</sup> )
Horizontal-UL	27.5 - 28.35	20.00	18.00	1.50	39.50	39	0.466	1.0
Vertical-UL	27.5 - 28.35	20.00	18.00	1.50	39.50	39	0.466	1.0
WiFi	2.4	18.72	1.00	-	19.72	39	0.005	1.0
LTE	0.777 - 0.787	25.00	1.60	-	26.60	39	0.024	0.518
Total:							0.984	1.0

Table 1-2. Calculated MPE Data for Simultaneous Transmissions

FCC ID: 2AUVU-P28DUGA1		MAXIMUM PERMISSIBLE EXPOSURE REPORT		Approved by: Technical Manager
Test Report S/N: 1M2008040118-05.2AUVU	Test Dates: 9/17/2020-10/16/2020	EUT Type: 5G mmWave Repeater (Donor Unit)	Page 4 of 5	

## 2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 39cm 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.

<b>FCC ID:</b> 2AUVU-P28DUGA1		<b>MAXIMUM PERMISSIBLE EXPOSURE REPORT</b>		<b>Approved by:</b> Technical Manager
<b>Test Report S/N:</b> 1M2008040118-05.2AUVU	<b>Test Dates:</b> 9/17/2020-10/16/2020	<b>EUT Type:</b> 5G mmWave Repeater (Donor Unit)	Page 5 of 5	

© 2020 PCTEST

V1.0

All rights reserved. Unless otherwise specified, no part of this report may be reproduced or utilized in any part, form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from PCTEST. If you have any questions about this international copyright or have an enquiry about obtaining additional rights to this report or assembly of contents thereof, please contact [INFO@PCTEST.COM](mailto:INFO@PCTEST.COM).