



RF EXPOSURE EVALUATION

Maximal Permissible Exposure [MPE]

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


Date of Testing:
6/29/2021-8/9/2021
Test Site/Location:
PCTEST Lab. Columbia, MD, USA
Test Report Serial No.:
1M2106240071-05.2AUVU

FCC ID: 2AUVU-P28SUHMGA1
APPLICANT: Pivotal Commware

Application Type: Certification
Model: PIV28SUHMGA1
EUT Type: 5G mmWave Repeater (Service 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



FCC ID: 2AUVU-P28SUHMGA1	 PCTEST <small>Proud to be part of  element</small>	MAXIMUM PERMISSIBLE EXPOSURE REPORT	 PIVOTAL <small>COMMWARE</small>	Approved by: Technical Manager
Test Report S/N: 1M2106240071-05.2AUVU	Test Dates: 6/29/2021-8/9/2021	EUT Type: 5G mmWave Repeater (Service Unit)		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	4
2.0	CONCLUSION	5

FCC ID: 2AUUV-P28SUHMGA1	 Proud to be part of  element	MAXIMUM PERMISSIBLE EXPOSURE REPORT		Approved by: Technical Manager
Test Report S/N: 1M2106240071-05.2AUUV	Test Dates: 6/29/2021-8/9/2021	EUT Type: 5G mmWave Repeater (Service 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 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-P28SUHMGA1** is a bidirectional 5G mmWave Repeater (Service Unit) that will be installed on a post as part of a system with a Donor Unit. The unit has an open-ended waveguide horn antenna installed facing towards an area to provide 5G coverage. The horn antenna has horizontal and vertical components which transmit simultaneously. These components are labeled “Horizontal Downlink” (H-DL) and “Vertical Downlink” (V-DL), respectively. 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-P28SUHMGA1	 Proud to be part of 	MAXIMUM PERMISSIBLE EXPOSURE REPORT		Approved by: Technical Manager
Test Report S/N: 1M2106240071-05.2AUVU	Test Dates: 6/29/2021-8/9/2021	EUT Type: 5G mmWave Repeater (Service 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/cm²)

π = 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.




(Horizontal-DL+ Vertical-DL + LTE + WiFi)								
Radio	Frequency (GHz)	Conducted Output Power (dBm)	Antenna Gain (dBi)	Tolerance (dB)	Tolerance Maximum Power (dBm)	Measurement Distance (cm)	Calculated MPE (mW/cm ²)	MPE Limit (mW/cm ²)
Horizontal-DL	27.5 - 28.35	20.00	14.00	1.50	35.50	26	0.418	1.0
Vertical-DL	27.5 - 28.35	20.00	14.00	1.50	35.50	26	0.418	1.0
WiFi	2.4	18.72	1.00	-	19.72	26	0.011	1.0
LTE	0.777 - 0.787	25.00	2.50	-	27.50	26	0.066	0.518
Total:							0.974	1.0

Table 1-2. Calculated MPE Data for Simultaneous Transmissions

FCC ID: 2AUVU-P28SUHMGA1	 PCTEST® Proud to be part of element	MAXIMUM PERMISSIBLE EXPOSURE REPORT	 PIVOTAL® COMMWARE	Approved by: Technical Manager
Test Report S/N: 1M2106240071-05.2AUVU	Test Dates: 6/29/2021-8/9/2021	EUT Type: 5G mmWave Repeater (Service Unit)	Page 4 of 5	

2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 26cm 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-P28SUHMGA1	 <small>Proud to be part of  element</small>	MAXIMUM PERMISSIBLE EXPOSURE REPORT		Approved by: Technical Manager
Test Report S/N: 1M2106240071-05.2AUVU	Test Dates: 6/29/2021-8/9/2021	EUT Type: 5G mmWave Repeater (Service Unit)	Page 5 of 5	