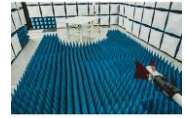




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RF EXPOSURE EVALUATION Maximum Permissible Exposure (MPE)

Applicant Name:
Pivotal Commware
22215 26th Ave SE #100
Bothell WA 98021
UNITED STATES

Date of Testing:
08/09/2023-10/02/2023
Test Report Issue Date:
10/20/2023
Test Site/Location:
Element lab., Columbia, MD, USA
Test Report Serial No.:
1M2308080090-02-R1.2AUVU

FCC ID:	2AUVU-5620-12-39
APPLICANT:	Pivotal Commware

Application Type: Certification
Model: 5620-12-39
EUT Type: 5G mmWave Repeater
FCC Classifications: Part 20 Industrial Booster (CMRS) (B2I)
FCC Rule Parts: FCC Part 1 (§1.1310) and Part 2 (§2.1091)
Test Procedure(s): KDB 447498 D01 v06

Note: This revised Test Report (S/N: 1M2308080090-02-R1.2AUVU) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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.

RJ Ortanez
Executive Vice President



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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(e)(1), 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)				
0.3-3.0	614	1.63	*(100)	6
3.0-30	1842/f	4.89/f	*(900/f ²)	6
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)				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*(180/f ²)	30
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

* = Plane-wave equivalent power density

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

1.2 EUT Description

The **Pivotal Commware Device FCC ID: 2AUVU-5620-12-39** is a bidirectional, two-unit repeater system consisting of a Donor Unit (DU) and a Service Unit (SU). Both units are required for operation as neither can be operated in a standalone configuration. This RF exposure analysis is for the DU.

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1.3 Procedure

This RF exposure analysis aims to achieve two things:

- 1) Exemption from routine environmental evaluation where the criteria is outlined in §1.1307(b)(3)(i)(C) and
- 2) Compliance with the MPE limits based on calculations for worst-case operation

The Donor Unit (DU) operates at a maximum single antenna polarization EIRP of 42dBm +/- 1.5dB. Additionally, the DU contains an FCC certified LTE module (FCC ID: XMR201906EG21G) operating on Bands 2, 4, 5, 12, 13, 25, 26, and 41. For RF Exposure analysis, we will consider LTE Band 12 as it has the tightest limit per §1.1310.

The ERP Threshold is calculated per 1.1307(b)(3)(i)(C) Table 1 for LTE (0.0128R²f) and for 5G NR FR2 (19.2R²).

Donor Unit	5G NR FR2	LTE	
Frequency	39975	699	MHz
λ	0.0075	0.4292	m
$\lambda/2\pi$	0.0012	0.0683	m
R	1.22	1.22	m
Threshold ERP	28.57728	13.3170125	W
Threshold ERP	44.56	41.24	dBm
Threshold EIRP	46.71	43.39	dBm

Table 1-2. Threshold ERP/EIRP Levels Per 1.1307(b)(3)(i)(C) for Donor Unit

A determination of exemption of routine environmental evaluation to demonstrate compliance with the RF exposure limits is allowed for multiple RF sources per 1.1307(b)(3)(ii)(B):

$$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{Exposure\ Limit_k} \leq 1$$

The DU transmits simultaneously from two orthogonally polarized antennas, each transmitting at 43.5dBm EIRP. The DU also contains an LTE module transmitting at a maximum of 28.1dBm EIRP.

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Based on these EIRP levels and the above calculated threshold levels, the summations are determined as follows:

	Donor Unit	
EIRP_H	43.5	dBm
EIRP_H	22.387	W
EIRP_th,H	46.867	W
EIRP_H/EIRP_th,H	0.478	
EIRP_V	43.5	dBm
EIRP_V	22.387	W
EIRP_th,V	46.867	W
EIRP_V/EIRP_th,V	0.478	
EIRP_LTE	28.1	dBm
EIRP_LTE	0.646	W
EIRP_th,LTE (f = 699MHz)	21.8399005	W
EIRP_LTE/EIRP_th,LTE	0.030	
Summation	0.985	

Table 1-3. RF Exposure Compliance for Simultaneous Transmissions

These calculations demonstrate that the DU, operating at a distance of 1.22m, is exempt from routine environmental evaluation for RF exposure compliance.

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2.0 CONCLUSION

The device meets the mobile RF exposure limit at a 1.22m 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.

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