

FCC RF Exposure Report

FCC ID: G95UCW4060MCS

Report No. : BTL-FCCP-6-2306C197
Equipment : Set Top Box
Model Name : UCW4060MCS
Brand Name : Vantiva
Applicant : Vantiva USA LLC
Address : 4855 Peachtree Industrial Blvd, Suite 200, Norcross, GA 30092, USA
Manufacturer : Vantiva USA LLC
Address : 4855 Peachtree Industrial Blvd, Suite 200, Norcross, GA 30092, USA
Factory : PT PEGATRON TECHNOLOGY INDONESIA
Address : Jalan Beringin Lot 2/Lot 5, Kawasan industrial Batamindo, Kel Mukakuning
 Kec Sei Beduk, Kota Batam Kepulauan, Batam, 29433, Indonesia

Standard(s) : 47 CFR § 2.1091
 FCC Guidelines for Human Exposure IEEE C95.1

Date of Receipt : 2023/7/4
Date of Test : 2023/7/17 ~ 2023/8/11
Issued Date : 2023/8/15

The above equipment has been tested and found in compliance with the requirement of the above standards by BTL Inc.

Prepared by : 
 Eddie Lee, Engineer

Approved by : 
 Jerry Chuang, Supervisor



BTL Inc.

No.18, Ln. 171, Sec. 2, Jiuzong Rd., Neihu Dist., Taipei City 114, Taiwan

Tel: +886-2-2657-3299 Fax: +886-2-2657-3331 Web: www.newbtl.com Service mail: btl_qa@newbtl.com

Declaration

BTL represents to the client that testing is done in accordance with standard procedures as applicable and that test instruments used has been calibrated with standards traceable to international standard(s) and/or national standard(s).

BTL's reports apply only to the specific samples tested under conditions. It is manufacture's responsibility to ensure that additional production units of this model are manufactured with the identical electrical and mechanical components. **BTL** shall have no liability for any declarations, inferences or generalizations drawn by the client or others from **BTL** issued reports.

This report is the confidential property of the client. As a mutual protection to the clients, the public and ourselves, the test report shall not be reproduced, except in full, without our written approval.

BTL's laboratory quality assurance procedures are in compliance with the **ISO/IEC 17025** requirements, and accredited by the conformity assessment authorities listed in this test report.

BTL is not responsible for the sampling stage, so the results only apply to the sample as received.

The information, data and test plan are provided by manufacturer which may affect the validity of results, so it is manufacturer's responsibility to ensure that the apparatus meets the essential requirements of applied standards and in all the possible configurations as representative of its intended use.

Limitation

For the use of the authority's logo is limited unless the Test Standard(s)/Scope(s)/Item(s) mentioned in this test report is (are) included in the conformity assessment authorities acceptance respective.

Please note that the measurement uncertainty is provided for informational purpose only and are not use in determining the Pass/Fail results.

REVISION HISTORY

Report No.	Version	Description	Issued Date	Note
BTL-FCCP-6-2306C197	R00	Original Report.	2023/8/15	Valid

1. LIMITS

According to § 1.1310 Radiofrequency radiation exposure limits.

- (a) Specific absorption rate (SAR) shall be used to evaluate the environmental impact of human exposure to radiofrequency (RF) radiation as specified in § 1.1307(b) of this part within the frequency range of 100 kHz to 6 GHz (inclusive).
- (b) The SAR limits for occupational/controlled exposure are 0.4 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 8 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit for occupational/controlled exposure is 20 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 6 minutes to determine compliance with occupational/controlled SAR limits.
- (c) The SAR limits for general population/uncontrolled exposure are 0.08 W/kg, as averaged over the whole body, and a peak spatial-average SAR of 1.6 W/kg, averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the parts of the human body treated as extremities, such as hands, wrists, feet, ankles, and pinnae, where the peak spatial-average SAR limit is 4 W/kg, averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). Exposure may be averaged over a time period not to exceed 30 minutes to determine compliance with general population/uncontrolled SAR limits.
- (e) Limits for Maximum Permissible Exposure (MPE) to radiofrequency electromagnetic fields (Table 1).

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(i) Limits for Occupational/Controlled Exposure				
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
300-1.500			f/300	<6
1.500-100.000			5	<6
(ii) Limits for General Population/Uncontrolled Exposure				
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
300-1.500			f/1500	<30
1.500-100.000			1.0	<30

f = frequency in MHz. * = Plane-wave equivalent power density.

2. APPLIED EXEMPTION CRITERIA

Refer to KDB 447498 D04, ticked item is applied:

For RF Exposure Test Exemptions for Single Source:

☒ 1-mW Test Exemption

Per § 1.1307(b)(3)(i)(A), a single RF source is exempt RF device (from the requirement to show data demonstrating compliance to RF exposure limits, as previously mentioned) if the available maximum time-averaged power is no more than 1 mW, regardless of separation distance.

This exemption applies to all operating configurations and exposure conditions, for the frequency range 100 kHz to 100 GHz, regardless of fixed, mobile, or portable device exposure conditions. This is a standalone exemption, and it cannot be applied in conjunction with any other test exemption.

☐ SAR-Based Exemption

A more comprehensive exemption, considering a variable power threshold that depends on both the separation distance and power, is provided in § 1.1307(b)(3)(i)(B). This exemption is applicable to the frequency range between 300 MHz and 6 GHz, with test separation distances between 0.5 cm and 40 cm, and for all RF sources in fixed, mobile, and portable device exposure conditions.

Accordingly, a RF source is considered an RF exempt device if its available maximum time-averaged (matched conducted) power or its effective radiated power (ERP), whichever is greater, are below a specified threshold. This exemption threshold was derived based on general population 1-g SAR requirements and is detailed in Appendix C.

§ 1.1307(b)(3)(i)(B):

Or the available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. This method shall only be used at separation distances (cm) from 0.5 centimeters to 40 centimeters and at frequencies from 0.3 GHz to 6 GHz (inclusive). P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 \text{ cm}} (d/20 \text{ cm})^x & d \leq 20 \text{ cm} \\ ERP_{20 \text{ cm}} & 20 \text{ cm} < d \leq 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10} \left(\frac{60}{ERP_{20 \text{ cm}} \sqrt{f}} \right) \text{ and } f \text{ is in GHz};$$

and

$$ERP_{20 \text{ cm}} \text{ (mW)} = \begin{cases} 2040f & 0.3 \text{ GHz} \leq f < 1.5 \text{ GHz} \\ 3060 & 1.5 \text{ GHz} \leq f \leq 6 \text{ GHz} \end{cases}$$

d = the separation distance (cm);

☐ **MPE-Based Exemption**

An alternative to the SAR-based exemption is provided in § 1.1307(b)(3)(i)(C), for a much wider frequency range, from 300 kHz to 100 GHz, applicable for separation distances greater or equal to $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. The MPE-based test exemption condition is in terms of ERP, defined as the product of the maximum antenna gain and the delivered maximum time-averaged power.¹⁰ For this case, a RF source is an RF exempt device if its ERP (watts) is no more than a frequency-dependent value, as detailed tabular form in Appendix B. These limits have been derived based on the basic specifications on Maximum Permissible Exposure (MPE) considered for the FCC rules in § 1.1310(e)(1).

§ 1.1307(b)(3)(i)(C):

Or using Table 1 and the minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. For the exemption in Table 1 to apply, R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters. If the ERP of a single RF source is not easily obtained, then the available maximum time-averaged power may be used in lieu of ERP if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

RF Source frequency (MHz)	Threshold ERP (watts)
0.3-1.34	$1920 R^2$.
1.34-30	$3450 R^2/f^2$.
30-300	$3.83 R^2$.
300-1500	$0.0128 R^2 f$.
1500-100000	$19.2 R^2$.

For RF Exposure Test Exemptions for Simultaneous Transmission Sources

☒ **1-mW Test Exemption for Multiple Sources**

As discussed in § 1.1307(b)(3)(ii)(A), the 1-mW exemption intended for single transmitters may be also applied to simultaneous transmission conditions, within the same host device, according one of the following criteria:

- When maximum available power each individual transmitting antenna within the same time averaging period is ≤ 1 mW, and the nearest parts of the antenna structures of the simultaneously operating transmitters are separated by at least 2 cm.
- When the aggregate maximum available power of all transmitting antennas is ≤ 1 mW in the same time-averaging period.

This exemption may not be combined with any other exemption.

☐ **Simultaneous Transmission with both SAR-based and MPE-Based Test Exemptions**

This case is described in detail in § 1.1307(b)(3)(ii)(B) and covers the situations where both SAR-based and MPE-based exemption may be considered for test exemption in fixed, mobile, or portable device exposure conditions. For these cases, a device with multiple RF sources transmitting simultaneously will be considered an RF exempt device if the condition of Formula (1) is satisfied.

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

Where:

- a* number of fixed, mobile, or portable RF sources claiming exemption using the § 1.1307(b)(3)(i)(B) formula for P_{th} , including existing exempt transmitters and those being added.
- b* number of fixed, mobile, or portable RF sources claiming exemption using the applicable § 1.1307(b)(3)(i)(C) Table 1 formula for Threshold ERP, including existing exempt transmitters and those being added.
- c* number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance.
- P_i the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source *i* at a distance between 0.5 cm and 40 cm (inclusive).
- $P_{th,i}$ the exemption threshold power (P_{th}) according to the § 1.1307(b)(3)(i)(B) formula for fixed, mobile, or portable RF source *i*.
- ERP_j the available maximum time-averaged power or the ERP, whichever is greater, of fixed, mobile, or portable RF source *j*.
- $ERP_{th,j}$ exemption threshold ERP for fixed, mobile, or portable RF source *j*, at a distance of at least $\lambda/2\pi$, according to the applicable § 1.1307(b)(3)(i)(C) Table 1 formula at the location in question.
- Evaluated_k* the maximum reported SAR or MPE of fixed, mobile, or portable RF source *k* either in the device or at the transmitter site from an existing evaluation.
- Exposure Limit_k* either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable sources, as applicable

The sum of the ratios of the applicable terms for SAR-based, MPE-based and measured SAR or MPE shall be less than 1, to determine simultaneous transmission exposure compliance.

3. EVALUATION FACILITY:

No. 68-1, Ln. 169, Sec. 2, Datong Rd., Xizhi Dist., New Taipei City 221, Taiwan
(FCC DN: TW0659)
☒ SAR01

4. TABLE FOR FILED ANTENNA

For BT:

Ant.	Brand	Model Name	Antenna Type	Connector	Frequency (MHz)	Gain (dBi)
BT	N/A	N/A	Printed	N/A	2400-2483.5	3.03

For WLAN 2.4GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Frequency (MHz)	Gain (dBi)
DB1	N/A	N/A	PIFA	I-PEX	2400-2483.5	2.72
DB2	N/A	N/A	PIFA	I-PEX	2400-2483.5	3.37

NOTE:

1) For CDD: Directional Gain=2.83 dBi.

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k/20}$ if the k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th antenna.

2) For TXBF: Directional Gain= $10 \log[(10^{G_1/20} + 10^{G_2/20} + \dots + 10^{G_N/20})^2 / N_{ANT}] = 5.57 \text{ dBi}$.

3) The antenna gain is provided by the manufacturer.

For RLAN 5GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Frequency (MHz)	Gain (dBi)
DB1	N/A	N/A	PIFA	I-PEX	5150-5350	4.28
					5470-5725	5.25
					5725-5850	5.25
DB2	N/A	N/A	PIFA	I-PEX	5150-5350	5.05
					5470-5725	4.65
					5725-5850	4.32

NOTE:

- 1) For CDD: UNII-1 Directional Gain=2.81 dBi, UNII-2A Directional Gain=2.81 dBi
UNII-2C Directional Gain=3.27 dBi, UNII-3 Directional Gain=3.29 dBi

$$DirectionalGain = 10 \cdot \log \left[\frac{\sum_{j=1}^{N_{SS}} \left\{ \sum_{k=1}^{N_{ANT}} g_{j,k} \right\}^2}{N_{ANT}} \right]$$

where

Each antenna is driven by no more than one spatial stream;

N_{SS} = the number of independent spatial streams of data;

N_{ANT} = the total number of antennas

$g_{j,k} = 10^{G_k/20}$ if the k th antenna is being fed by spatial stream j , or zero if it is not;
 G_k is the gain in dBi of the k th antenna.

- 2) For TXBF: Directional Gain= $10\log[(10^{G1/20}+10^{G2/20}+...10^{GN/20})^2/ N_{ANT}]$ dBi.
Then, UNII-1 Directional Gain=5.69 dBi, UNII-2A Directional Gain=5.69 dBi
UNII-2C Directional Gain=5.84 dBi, UNII-3 Directional Gain=5.46 dBi
3) The antenna gain is provided by the manufacturer.

5. MAXIMUM RF OUTPUT POWER

Mode	Maximum Output Power (dBm)
BT	11.97
BLE	11.99
WLAN 2.4GHz	23.36
RLAN 5GHz	25.45

6. CALCULATION RESULTS

Band	Minimum Operation Frequency (MHz)	Maximum Power (dBm)	Antenna Gain (dBi)	EIRP Power (dBm)	EIRP Power (W)	Distance (cm)	Power Density (mW/cm ²)	Limit of Power Density (mW/cm ²)	MPE Ratio	Result
BT	2402.0	11.97	3.03	15.00	0.03162	36	0.0019	1.0000	0.0019	Pass
BLE	2402.0	11.99	3.03	15.02	0.03177	36	0.0020	1.0000	0.0020	Pass
WLAN 2.4G	2412.0	23.36	2.83	26.19	0.41591	36	0.0255	1.0000	0.0255	Pass
RLAN 5G	5795.0	25.32	3.29	28.61	0.72611	36	0.0446	1.0000	0.0446	Pass

1. Minimum operation frequency is applied for severe limit.
2. MPE Ratio = Power Density / Limit of Power Density

End of Test Report