

RF Exposure Report

Report No.: MFBBNT-WTW-P22061057

FCC ID: SLE-LE910CXNF

Test Model: UC-3121-T-US-LX

Series Model: UC-3nnn-v-w-x-y-zzzzzz and OnCell 31nn-LTE-n-x-w-zzzzzz

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

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FCC Registration / 281270 / TW0032

Designation Number:



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Release Control Record

Issue No.	Description	Date Issued
MFBBNT-WTW-P22061057	Original release.	Nov. 17, 2022

1 Certificate of Conformity

Product: UC-3100 Series wireless computer , OnCell 3100 Series cellular gateway

Brand: MOXA

Test Model: UC-3121-T-US-LX

Series Model: UC-3nnn-v-w-x-y-zzzzzz and OnCell 31nn-LTE-n-x-w-zzzzzz

Sample Status: Engineering sample

Applicant: Moxa Inc.

FCC Rule Part: FCC Part 2 (Section 2.1091)

Standards: KDB 447498 D01 General RF Exposure Guidance v06

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's RF characteristics under the conditions specified in this report.

Prepared by : Gina Liu , **Date:** Nov. 17, 2022
Gina Liu / Specialist

Approved by : Jeremy Lin , **Date:** Nov. 17, 2022
Jeremy Lin / Project Engineer

2 RF Exposure

2.1 Limits for Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average Time (minutes)
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
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

f = Frequency in MHz ; *Plane-wave equivalent power density

2.2 MPE Calculation Formula

$$Pd = (P_{out} * G) / (4 * \pi * r^2)$$

where

Pd = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

pi = 3.1416

r = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20cm away from the body of the user. So, this device is classified as **Mobile Device**.

3 Calculation Result of Maximum Conducted Power

1. The WLAN/BT module (FCC ID: Z64-WL18DBMOD, Brand: Texas Instruments, Model: WL18MODGI) is collocated in the host device.
2. All models are listed as below.

Model	Definition
UC-3nnn-v-w-x-y-zzzzzz and OnCell3nnn-v-w-x-y-zzzzzz	n = 0-9 (standards for different model issue) v = CT or blank (standards for coating issue) w = T or blank (standard for temperature issue) x = US, EU, AU or blank (standards for regional issue) y = CE, LX or blank (standards for OS issue) z = 0-9, A-Z, or blank (standards for marketing issue)

3. The following models are provided by client and used for testing. Model UC-3121-T-US-LX is the representative for final test.

Model	Difference
UC-3101-T-US-LX	1 GHz CPU, 1GB RAM, 8 GB eMMC, 2 Ethernet ports, 1 serial port, 1 USB port, 1 GPS, onboard LTE-US cat.1 module and Debian 9 (kernel 4.4) pre-installed, -40 to 70°C operating temperature
UC-3111-T-US-LX	1 GHz CPU, 1GB RAM, 8GB eMMC, 2 Ethernet ports, 2 serial port, 1 USB port, 1 GPS, 1 SD slot, onboard LTE-US cat.1 module and Debian 9 (kernel 4.4) pre-installed, -40 to 70°C operating temperature
UC-3121-T-US-LX	1 GHz CPU, 1GB RAM, 8GB eMMC, 2 Ethernet ports, 1 serial port, 1 USB port, 1 GPS, 1 CAN port, 1 SD slot, onboard LTE-US cat.1 module and Debian 9 (kernel 4.4) pre-installed, -40 to 70°C operating temperature
OnCell 3120-LTE-1-US-T	Industrial LTE Cat 1 cellular gateway, B2/B4/B5/B12/B13/B14/B66/B71, 1 x RS232/422/485 serial port, 2 x 10/100BaseT(X) RJ45 ports, 0 to 55°C
OnCell 3120-LTE-1-US	Industrial LTE Cat 1 cellular gateway, B2/B4/B5/B12/B13/B14/B66/B71, 1 x RS232/422/485 serial port, 2 x 10/100BaseT(X) RJ45 ports, -30 to 70°C

*OnCell 3120 and UC-3101: The only difference is UI interface.

4. The EUT uses following antennas.

WLAN / BT			
Type	Dipole	Connecter	RP-SMA
Brand	KINSUN INDUSTRIES INC.	Model	1710010100213 (ANT-WDB-ARM-02)
Frequency	2.4GHz / BT	5GHz	5.8GHz
Gain (dBi) (w/o cable loss)	1.8	1.0	-4.5

WWAN								
Type	Dipole			Connecter			SMA(Male) Swivel Plug	
Brand	SANAV			Serial No			ANT-LTE-ASM-05 BK	
Band	B2	B4	B5	B12	B13	B14	B66	B71
Gain (dBi) (w/o cable loss)	1.94	2.85	1.82	0.47	4.04	4.04	2.85	0.47

Function	Frequency (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN	2412~2462	23.87	4.81	20	0.147	1
WLAN	5180~5240	16.98	1.0	20	0.012	1
WLAN	5260~5320	17.20	1.0	20	0.013	1
WLAN	5500~5700	18.44	1.0	20	0.017	1
WLAN	5745~5825	17.88	-4.5	20	0.004	1
BT EDR	2402~2480	12.50	1.8	20	0.005	1
BT LE	2402~2480	6.92	1.8	20	0.001	1
WCDMA Band 2	1852.4~1907.6	24.74	1.94	20	0.093	1
WCDMA Band 4	1712.4~1752.6	25.10	2.85	20	0.124	1
WCDMA Band 5	826.4~846.6	25.14	1.82	20	0.099	0.551
LTE Band 2 (Channel Bandwidth 3MHz)	1851.5~1908.5	24.57	1.94	20	0.089	1
LTE Band 4 (Channel Bandwidth 5MHz)	1712.5~1752.5	24.59	2.85	20	0.110	1
LTE Band 5 (Channel Bandwidth 5MHz)	826.5~846.5	25.10	1.82	20	0.098	0.551
LTE Band 12 (Channel Bandwidth 1.4MHz)	699.7~715.3	24.74	0.47	20	0.066	0.466
LTE Band 13 (Channel Bandwidth 5MHz)	779.5~784.5	24.96	4.04	20	0.158	0.520
LTE Band 14 (Channel Bandwidth 5MHz)	790.5~795.5	24.38	4.04	20	0.138	0.527
LTE Band 66 (Channel Bandwidth 3MHz)	1711.5~1778.5	24.41	2.85	20	0.106	1
LTE Band 71 (Channel Bandwidth 5MHz)	665.5~695.5	24.00	0.47	20	0.056	0.444

Note: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

For WLAN 2.4G antenna gain: Directional Gain = 1.8dBi + 10log(2) = 4.81dBi

Conclusion:

The formula of calculated the MPE is:

$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$

CPD = Calculation power density

LPD = Limit of power density

Max. WLAN + BT + WWAN = $0.147/1 + 0.005/1 + 0.158/0.520 = 0.456 < 1$

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