

## RF Exposure Report

**Report No.:** SA200203E11A

**FCC ID:** 2AF5PML2410

**Test Model:** ML2410

**Series Model:** ML2410XY

(where both X and Y can be A, B, C, D or blank)

**Received Date:** Feb. 03, 2020

**Test Date:** Feb. 21, 2020

**Issued Date:** Mar. 31, 2020

**Applicant:** MTRLC LLC

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

**Test Location:** E-2, No.1, Li Hsin 1st Road, Hsinchu Science Park, Hsinchu City 300,  
Taiwan

**FCC Registration /  
Designation Number:** 723255 / TW2022

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### Release Control Record

Issue No.	Description	Date Issued
SA200203E11A	Original release.	Mar. 31, 2020

## 1 Certificate of Conformity

**Product:** AC1900 LTE Router

**Brand:** Motorola

**Test Model:** ML2410

**Series Model:** ML2410XY

(where both X and Y can be A, B, C, D or blank)

**Sample Status:** ENGINEERING SAMPLE

**Applicant:** MTRLC LLC

**Test Date:** Feb. 21, 2020

**Standards:** FCC Part 2 (Section 2.1091)

IEEE C95.3-2002

**References Test Guidance:** 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 EMC characteristics under the conditions specified in this report.

**Prepared by :** Phoenix Huang , **Date:** Mar. 31, 2020  
Phoenix Huang / Specialist

**Approved by :** Clark Lin , **Date:** Mar. 31, 2020  
Clark Lin / Technical Manager

## 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 <sup>2</sup> )	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 <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1500	...	...	f/1500	30
1500-100,000	...	...	1.0	30

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

### 2.1 MPE Calculation Formula

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

where

$P_d$  = power density in mW/cm<sup>2</sup>

$P_{out}$  = 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

### 2.2 Classification

The antenna of this product, under normal use condition, is at least 38 cm away from the body of the user. So, this device is classified as **Mobile Device**.

### 2.3 Antenna Gain

WLAN Antenna							
Ant. No.	RF Chain No.	Brand	Ant. Net Gain	Frequency Range (GHz)	Antenna Type	Connector Type	Cable Length (mm)
1	WiFi Chain0	Airgain	4.3 dBi, 4.3 dBi, 5.5 dBi	2.4 to 2.49, 5.15 to 5.35, 5.47 to 5.85	PCB	i-pex(MHF)	140
2	WiFi Chain1	Airgain	3.2 dBi, 4.4 dBi, 4.1 dBi	2.4 to 2.49, 5.15 to 5.35, 5.47 to 5.85	PCB	i-pex(MHF)	170
3	WiFi Chain2	Airgain	4.6 dBi, 4.9 dBi, 5.4 dBi	2.4 to 2.49, 5.15 to 5.35, 5.47 to 5.85	PCB	i-pex(MHF)	100
WWAN Antenna							
Ant. No.	RF Chain No.	Brand	Ant. Net Gain	Frequency Range (MHz)	Antenna Type	Connector Type	Cable Length (mm)
1	LTE MAIN	Cortec	1.08 dBi 3.19 dBi	617 ~ 894 1710 ~ 2200	Dipole	SMA	280
2	LTE AUX	Cortec	1.08 dBi 3.19 dBi	617 ~ 894 1710 ~ 2200	Dipole	SMA	200

## 2.4 Calculation Result of Maximum Conducted Power

The 2.4GHz and 5GHz (U-NII-1 band and U-NII-3 band) maximum power was refer to the FCC test report (Report No.: RF200203E11, RF200203E11-1)

### For WLAN

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
WLAN (2.4GHz)	2412~2462	938.289	8.83	38	0.39497	1
WLAN (U-NII-1)	5180~5250	807.114	9.31	38	0.37945	1
WLAN (U-NII-2A)	5260~5320	227.505	9.31	38	0.10696	1
WLAN (U-NII-2C)	5500~5720	244.026	9.79	38	0.12813	1
WLAN (U-NII-3)	5745~5850	969.735	9.79	38	0.50919	1

#### NOTE:

- Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.
- 2.4GHz: The directional gain is =  $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 8.83 \text{ dBi}$
- 5GHz:  
 U-NII-1, U-NII-2A: The directional gain is =  $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 9.31 \text{ dBi}$   
 U-NII-2C, U-NII-3: The directional gain is =  $10 \log[(10^{G0/20} + 10^{G1/20} + 10^{G2/20})^2 / 3] = 9.79 \text{ dBi}$

### For WWAN module < Worst Case > (FCC ID: XMR201808EC25AF)

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm <sup>2</sup> )	Limit (mW/cm <sup>2</sup> )
LTE B12	699.7~715.3	237	1.08	38	0.01675	0.46647

Note: \*Limit of Power Density = F/1500

#### 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

$$\text{WLAN 2.4GHz} + \text{WLAN 5GHz} + \text{LTE B12} = 0.39497 / 1 + 0.50919 / 1 + 0.01675 / 0.46647 = 0.94007$$

**Therefore the maximum calculations of above situations are less than the "1" limit.**

## Appendix

WWAN module

MPE Evaluation for FCC ID: XMR201808EC25AF Module (Brand: Quectel; Model: EC25-AF)

Mode	Equipment Category	Transmitter Range (MHz)		Maximum Output Power		Antenna Gain (dBi)	Power Density (mW/cm <sup>2</sup> )		Ratio
		Start	Stop	(dBm)	(W)		Vaule	Limit	
WCDMA	WCDMA II	1852.4	1907.6	23.18	208	3.19	0.02389	1	0.02389
	WCDMA IV	1712.4	1752.6	23.46	222	3.19	0.02550	1	0.02550
	WCDMA V	826.4	846.6	23.20	209	1.08	0.01477	0.55093*	0.02681
LTE	Band 2	1850.7	1909.3	23.86	243	3.19	0.02791	1	0.02791
	Band 4	1710.7	1754.3	23.73	236	3.19	0.02711	1	0.02711
	Band 5	824.7	848.3	24.05	254	1.08	0.01795	0.5498*	0.03265
	Band 12	699.7	715.3	23.75	237	1.08	0.01675	0.46647*	0.03591
	Band 13	779.5	784.5	23.86	243	1.08	0.01717	0.51967*	0.03304
	Band 14	788.4	798	23.87	244	1.08	0.01724	0.5256*	0.03280
	Band 66	1710.7	1779.3	23.82	241	3.19	0.02768	1	0.02768
Band 71	665.5	695.5	23.46	222	1.08	0.01569	0.44367*	0.03536	

Note: \*Limit of Power Density = F/1500

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