

RF Exposure Report

Report No.: MFBCMA-WTW-P23030799A

FCC ID: RAXTMOG4AR

Test Model: TMO-G4AR

Received Date: 2023/3/15

Test Date: 2023/5/11

Issued Date: 2023/5/26

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



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Release Control Record

Issue No.	Description	Date Issued
MFBCMA-WTW-P23030799A	Original release.	2023/5/26

1 Certificate of Conformity

Product: 5G Gateway

Brand: T-Mobile

Test Model: TMO-G4AR

Sample Status: Engineering sample

Applicant: Arcadyan Technology Corporation

Test Date: 2023/5/11

FCC Rule Part: FCC Part 2 (Section 2.1091)

Standard: 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.

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May Chen / 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 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

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

where

P_d = power density in mW/cm²

P_{out} = output power to antenna in mW

G = gain of antenna in linear scale

π = 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 21 cm away from the body of the user. So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain (dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
Wi-Fi + BT	Ant. 0	PSA	RFPCA261017IMLB403_A	1.77	2.4~2.4835 GHz	Dipole	ipex(MHF1)	171
				0.68	5.15~5.25 GHz			
				0.81	5.25~5.35 GHz			
				1.25	5.47~5.725 GHz			
				2.35	5.725~5.85 GHz			
	Ant. 1	PSA	RFPCA261013IMLB402_A	1.49	2.4~2.4835 GHz	Dipole	ipex(MHF1)	130
				0.42	5.15~5.25 GHz			
				1.01	5.25~5.35 GHz			
				1.68	5.47~5.725 GHz			
				2.14	5.725~5.85 GHz			
	Ant. 2	PSA	RFPCA261007IMLB402_A	1.33	2.4~2.4835 GHz	Dipole	ipex(MHF1)	75
				0.71	5.15~5.25 GHz			
				1.12	5.25~5.35 GHz			
				1.54	5.47~5.725 GHz			
				2.13	5.725~5.85 GHz			
	Ant. 3	PSA	RFPCA261008IMLB401_A	1.25	2.4~2.4835 GHz	Dipole	ipex(MHF1)	80
				0.58	5.15~5.25 GHz			
				1.23	5.25~5.35 GHz			
				1.49	5.47~5.725 GHz			
				2.32	5.725~5.85 GHz			
BT+DFS(RX)	PSA	RFPCA261024IMLB401_A	4.72	2.4~2.4835 GHz	Dipole	ipex(MHF1)	245	
			3.90	5.15~5.25 GHz				
			4.23	5.25~5.35 GHz				
			4.43	5.47~5.725 GHz				
			4.43	5.725~5.85 GHz				

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain (dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)	
WWAN Antenna (Internal)	B71 (TRx) (M2)	PSA	RFPCA811609IMMB403_B	3.17	663-698 MHz	Monopole	ipex(MHF1)	94	
	B71 (Rx)(M1)		RFPCA811609IMMB402_A	3.10	663-698 MHz	Monopole	ipex(MHF1)	93	
	B71 (Rx) (D1)		RFPCA652018IMMB401_A	2.09	663-698 MHz	Monopole	ipex(MHF1)	205	
	B71 (Rx)(D2)		RFFPA656320IMMB401_B	2.01	663-698 MHz	Monopole	ipex(MHF1)	189	
	B12 (TRx)(M2)	PSA	RFPCA811609IMMB403_B	3.34	698-716 MHz	Monopole	ipex(MHF1)	94	
	B12 (Rx)(D2)		RFFPA656320IMMB401_B	2.05	698-716 MHz	Monopole	ipex(MHF1)	189	
	B5 (TRx)(M2)	PSA	RFPCA811609IMMB403_B	1.68	824-849 MHz	Monopole	ipex(MHF1)	94	
	B5 (Rx) (D2)		RFFPA656320IMMB401_B	0.63	824-849 MHz	Monopole	ipex(MHF1)	189	
	B4/B66 (TRx) (M2)	PSA	RFPCA811609IMMB403_B	3.69	1710-1780 MHz	Monopole	ipex(MHF1)	94	
	B4/B66 (TRx) (M1)		RFPCA811609IMMB402_A	5.13	1710-1780 MHz	Monopole	ipex(MHF1)	93	
	B4/B66 (Rx) (D1)		RFPCA652018IMMB401_A	4.26	1710-1780 MHz	Monopole	ipex(MHF1)	205	
	B4/B66 (Rx) (D2)		RFFPA656320IMMB401_B	4.10	1710-1780 MHz	Monopole	ipex(MHF1)	189	
	B2/B25 (TRx) (M2)	PSA	RFPCA811609IMMB403_B	3.33	1850-1915 MHz	Monopole	ipex(MHF1)	94	
	B2/B25 (TRx) (M1)		RFPCA811609IMMB402_A	4.78	1850-1915 MHz	Monopole	ipex(MHF1)	93	
	B2/B25 (Rx) (D1)		RFPCA652018IMMB401_A	3.79	1850-1915 MHz	Monopole	ipex(MHF1)	205	
	B2/B25 (Rx) (D2)		RFFPA656320IMMB401_B	4.11	1850-1915 MHz	Monopole	ipex(MHF1)	189	
	B41 (TRx) (M2)	PSA	RFPCA811609IMMB403_B	2.78	2496-2690 MHz	Monopole	ipex(MHF1)	94	
	B41 (TRx) (M1)		RFPCA811609IMMB402_A	3.02	2496-2690 MHz	Monopole	ipex(MHF1)	93	
	B41 (Rx) (Omni-Antenna HC1O)		RFPCA380906IMMB401_A	4.45	2496-2690 MHz	Dipole	ipex(MHF1)	60	
	B41 (Rx) (Omni-Antenna HC2O)		RFPCA380912IMMB401_A	3.67	2496-2690 MHz	Dipole	ipex(MHF1)	125	
	B41 (Rx) (Semi-Antenna HC1S)		RFPCA474709IMMB401_A	7.59	2496-2690 MHz	Dipole	ipex(MHF1)	96	
	B41 (Rx) (Semi-Antenna HC2S)		RFPCA474709IMMB401_A	7.76	2496-2690 MHz	Dipole	ipex(MHF1)	82	
	B48 (TRx) (M2)		PSA	RFPCA811609IMMB403_B	0.94	3550-3700 MHz	Monopole	ipex(MHF1)	94
	B48 (TRx) (M1)			RFPCA811609IMMB402_A	1.02	3550-3700 MHz	Monopole	ipex(MHF1)	93
	B48 (Rx) (Omni-Antenna HC1O)	RFPCA380906IMMB401_A		4.64	3550-3700 MHz	Dipole	ipex(MHF1)	60	
	B48 (Rx) (Omni-Antenna HC2O)	RFPCA380912IMMB401_A		4.03	3550-3700 MHz	Dipole	ipex(MHF1)	125	
	B48 (Rx) (Semi-Antenna HC1S)	RFPCA474709IMMB401_A		7.67	3550-3700 MHz	Dipole	ipex(MHF1)	96	
	B48 (Rx) (Semi-Antenna HC2S)	RFPCA474709IMMB401_A		8.01	3550-3700 MHz	Dipole	ipex(MHF1)	82	

Antenna NO.	RF Chain NO.	Brand	Model	Antenna Net Gain (dBi)	Frequency range	Antenna Type	Connector Type	Cable Length (mm)
WWAN Antenna (Internal)	B77 (TRx) (M2)	PSA	RFPCA811609IMMB403_B	0.84	3300-4200 MHz	Monopole	ipex(MHF1)	94
	B77(TRx) (M1)		RFPCA811609IMMB402_A	0.91	3300-4200 MHz	Monopole	ipex(MHF1)	93
	B77 (Rx) (Omni-Antenna HC1O)		RFPCA380906IMMB401_A	4.73	3300-4200 MHz	Dipole	ipex(MHF1)	60
	B77 (Rx) (Omni-Antenna HC2O)		RFPCA380912IMMB401_A	4.14	3300-4200 MHz	Dipole	ipex(MHF1)	125
	B77 (Rx) (Semi-Antenna HC1S)		RFPCA474709IMMB401_A	7.98	3300-4200 MHz	Dipole	ipex(MHF1)	96
	B77 (Rx) (Semi-Antenna HC2S)		RFPCA474709IMMB401_A	8.13	3300-4200 MHz	Dipole	ipex(MHF1)	82

* Detail antenna specification please refer to antenna datasheet and/or antenna measurement report.

2.5 Calculation Result of Maximum Conducted Power

All data was copied from the original test report (Report No.: MFBCMA-WTW-P23030799), except the 5GHz DFS band (U-NII-2A & U-NII-2C band).

For Bluetooth

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
Bluetooth	2402-2480	11.83	4.72	21	0.00633	1	Pass

For WLAN - CDD Mode

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
WLAN 2.4 GHz	2412-2462	988.614	1.77	21	0.26815	1	Pass
WLAN 5 GHz (U-NII-1 & U-NII-4)	5180-5240 5745-5825	997.474	2.35	21	0.30921	1	Pass
WLAN 5 GHz (U-NII-2A & U-NII-2C)	5260-5320 5500-5720	249.227	1.68	21	0.06621	1	Pass

For WLAN - Beamforming Mode

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
WLAN 2.4 GHz	2412-2462	641.372	7.48	21	0.64783	1	Pass
WLAN 5 GHz (U-NII-1 & U-NII-4)	5180-5240 5745-5825	863.913	6.62	21	0.71585	1	Pass
WLAN 5 GHz (U-NII-2A & U-NII-2C)	5260-5320 5500-5720	195.65	7.06	21	0.17940	1	Pass

For WWAN

Operation Mode	Evaluation Frequency (MHz)	Max Avg. Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)	Result
LTE Band 2	1850.7-1909.3	242.103	4.78	21	0.13133	1	Pass
LTE Band 4	1710.7-1754.3	236.048	5.13	21	0.13879	1	Pass
LTE Band 5	824.7-848.3	245.471	1.68	21	0.06522	0.5498	Pass
LTE Band 12	699.7-715.3	261.216	3.34	21	0.10171	0.46647	Pass
LTE Band 25	1850.7-1914.3	245.471	4.78	21	0.13315	1	Pass
LTE Band 48	3652.5-3690	128.233	1.02	21	0.02927	1	Pass
LTE Band 66	1710.7-1779.3	242.661	5.13	21	0.14268	1	Pass
LTE Band 71	665.5-695.5	264.241	3.17	21	0.09894	0.44367	Pass
5G nR Band 25	1852.5-1912.5	178.649	4.78	21	0.09691	1	Pass
5G nR Band 41	2506.02-2679.99	642.688	3.02	21	0.23246	1	Pass
5G nR Band 48	3555-3694.995	80.91	1.02	21	0.01847	1	Pass
5G nR Band 66	1712.5-1777.5	197.242	5.13	21	0.11597	1	Pass
5G nR Band 71	665.5-695.5	252.348	3.17	21	0.09448	0.44367	Pass
5G nR Band 77	3460.02-3540	647.143	0.91	21	0.14400	1	Pass
5G nR Band 77	3710.01-3969.99	651.628	0.91	21	0.14499	1	Pass

NOTE:

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

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

WLAN - CDD Mode

WLAN 2.4 GHz + LTE Band 71 = $0.26815 / 1 + 0.09713 / 0.442 = 0.48790$

WLAN 2.4 GHz + NR 71 = $0.26815 / 1 + 0.11075 / 0.442 = 0.51872$

WLAN 5 GHz + Bluetooth + LTE Band 71 = $0.30921 / 1 + 0.00633 / 1 + 0.09713 / 0.442 = 0.53529$

WLAN 5 GHz + Bluetooth + NR 71 = $0.30921 / 1 + 0.00633 / 1 + 0.11075 / 0.442 = 0.56611$

WLAN - Beamforming Mode

WLAN 2.4 GHz + LTE Band 71 = $0.64783 / 1 + 0.09713 / 0.442 = 0.86758$

WLAN 2.4 GHz + NR 71 = $0.64783 / 1 + 0.11075 / 0.442 = 0.89840$

WLAN 5 GHz + Bluetooth + LTE Band 71 = $0.71585 / 1 + 0.00633 / 1 + 0.09713 / 0.442 = 0.94193$

WLAN 5 GHz + Bluetooth + NR 71 = $0.71585 / 1 + 0.00633 / 1 + 0.11075 / 0.442 = 0.97275$

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

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