

RF Exposure Evaluation Report

APPLICANT : MTRLC LLC
EQUIPMENT : D3.1 Cable Modem plus AX3000 Router
BRAND NAME : Motorola
MODEL NAME : G11
FCC ID : 2AF5PG11
STANDARD : 47 CFR Part 2.1091
FCC KDB 447498 D01 v06

The product evaluation date was started from Feb. 16, 2023 and completed on Feb. 16, 2023. We, Sporton International Inc. (Shenzhen), would like to declare that the device has been evaluated in accordance with 47 CFR Part 2.1091 and FCC KDB 447498 D01 v06, and pass the limit. Without written approval of Sporton International Inc. (Shenzhen), the test report shall not be reproduced except in full.



Approved by: Si Zhang

Sporton International Inc. (Shenzhen)

1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055
People's Republic of China



Table of Contents

1. ADMINISTRATION DATA	4
1.1. Testing Laboratory	4
2. DESCRIPTION OF EQUIPMENT UNDER TEST (EUT)	5
3. MAXIMUM RF AVERAGE OUTPUT TUNE UP POWER AMONG PRODUCTION UNITS	6
4. RF EXPOSURE LIMIT INTRODUCTION	9
5. RADIO FREQUENCY RADIATION EXPOSURE EVALUATION	10
5.1. Standalone Power Density Calculation	10



1. Administration Data

1.1. Testing Laboratory

Sporton International Inc. (Shenzhen) is accredited to ISO/IEC 17025:2017 by American Association for Laboratory Accreditation with Certificate Number 5145.01.

Testing Laboratory			
Test Firm	Sporton International Inc. (Shenzhen)		
Test Site Location	1/F, 2/F, Bldg 5, Shiling Industrial Zone, Xinwei Village, Xili, Nanshan, Shenzhen, 518055 People's Republic of China TEL: +86-755-86379589 FAX: +86-755-86379595		
Test Site No.	Sporton Site No.	FCC Designation No.	FCC Test Firm Registration No.
	SAR01-SZ	CN1256	421272

Applicant	
Company Name	MTRLC LLC
Address	275 Turnpike Street Suite 101 Canton, MA 02021

Manufacturer	
Company Name	MTRLC LLC
Address	275 Turnpike Street Suite 101 Canton, MA 02021

2. Description of Equipment Under Test (EUT)

Product Feature & Specification	
EUT Type	D3.1 Cable Modem plus AX3000 Router
Brand Name	Motorola
Model Name	G11
FCC ID	2AF5PG11
Wireless Technology and Frequency Range	WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz WLAN 5.9GHz Band: 5845 MHz ~ 5885 MHz
Mode	WLAN 2.4GHz 802.11b/g/n HT20/HT40 WLAN 2.4GHz 802.11ax HE20/HE40 WLAN 5GHz 802.11a/n HT20/HT40 WLAN 5GHz 802.11ac VHT20/VHT40/VHT80 WLAN 5GHz 802.11ax HE20/HE40/HE80/HE160
Antenna Gain	ANT1: WLAN2.4GHz: 2.50 dBi WLAN5.2GHz: 3.50 dBi WLAN5.3GHz: 3.50 dBi WLAN5.5GHz: 3.50 dBi WLAN5.8GHz: 3.50 dBi WLAN5.9GHz: 3.50 dBi ANT2: WLAN2.4GHz: 2.50 dBi WLAN5.2GHz: 3.50 dBi WLAN5.3GHz: 3.50 dBi WLAN5.5GHz: 3.50 dBi WLAN5.8GHz: 3.50 dBi WLAN5.9GHz: 3.50 dBi
Antenna Type	WLAN: Dipole Antenna
HW Version	REV1.0
SW Version	G11-22.3.3 DAG
EUT Stage	Identical Prototype

Remark:

1. The above EUT's information was declared by manufacturer. Please refer to the specifications or user's manual for more detailed description.
2. WLAN2.4GHz/WLAN5GHz all support SISO/MIMO(CDD) and beamforming mode, for MIMO mode power is higher than SISO mode, So chose MIMO tune up power to perform MPE calculation conservatively.
3. WLAN2.4GHz and WLAN5GHz chose the higher SISO gain as MIMO gain to perform MPE calculation.
4. The gain calculation method of WLAN beamforming mode is referenced to KDB 662911.

Comments and Explanations:

1. The declared of product specification for EUT presented in the report are provided by the manufacturer, and the manufacturer takes all the responsibilities for the accuracy of product specification.
2. The maximum RF output tune up power, antenna gain also the safe distance used for evaluate RF exposure were declared by manufacturer.



3. Maximum RF average output tune up power among production units

<For SISO/CDD/MIMO mode>

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)		
		Ant.1	Ant.2	Ant.1+2
2.4GHz	802.11b	28.00	28.00	30.00
	802.11g	27.00	27.00	30.00
	802.11n-HT20	25.00	25.00	28.00
	802.11n-HT40	20.00	20.00	23.00
	802.11ax-HE20	25.00	25.00	28.00
	802.11ax-HE40	20.00	20.00	23.00

<5GHz WLAN >

Mode		Maximum Average Power (dBm)		
		Ant.1	Ant.2	Ant.1+2
5.2GHz	802.11a	26.00	26.00	29.00
	802.11n-HT20	26.00	26.00	29.00
	802.11n-HT40	27.00	27.00	30.00
	802.11ac-VHT20	26.00	26.00	29.00
	802.11ac-VHT40	27.00	27.00	30.00
	802.11ac-VHT80	20.00	21.00	23.50
	802.11ax-HE20	26.00	26.00	29.00
	802.11ax-HE40	27.00	27.00	30.00
5.3GHz	802.11a	20.00	20.00	23.00
	802.11n-HT20	20.00	20.00	23.00
	802.11n-HT40	21.00	21.00	23.98
	802.11ac-VHT20	20.00	20.00	23.00
	802.11ac-VHT40	21.00	21.00	23.98
	802.11ac-VHT80	17.00	19.00	21.10
	802.11ax-HE20	20.00	20.00	23.00
	802.11ax-HE40	21.00	21.00	23.98
	802.11ax-HE80	17.00	19.00	21.10
	802.11ax-HE160	16.00	16.00	19.00
5.5GHz	802.11a	20.00	20.00	23.00
	802.11n-HT20	20.00	20.00	23.00
	802.11n-HT40	21.00	22.00	23.98
	802.11ac-VHT20	20.00	20.00	23.00
	802.11ac-VHT40	21.00	22.00	23.98
	802.11ac-VHT80	21.00	22.00	23.98
	802.11ax-HE20	20.00	21.00	23.50
	802.11ax-HE40	21.00	22.00	23.98
	802.11ax-HE80	21.00	22.00	23.98
5.8GHz	802.11a	18.00	19.00	21.50
	802.11n-HT20	26.00	27.00	29.50
	802.11n-HT20	26.00	28.00	30.00



	802.11n-HT40	26.00	27.00	29.50
	802.11ac-VHT20	26.00	28.00	30.00
	802.11ac-VHT40	26.00	27.00	29.50
	802.11ac-VHT80	23.00	24.00	26.50
	802.11ax-HE20	26.00	28.00	30.00
	802.11ax-HE40	26.00	27.00	29.50
	802.11ax-HE80	23.00	24.00	26.50
5.9GHz	802.11a	23.00	24.00	26.50
	802.11n-HT20	23.00	24.00	26.50
	802.11n-HT40	26.00	27.00	29.50
	802.11ac-VHT20	23.00	24.00	26.50
	802.11ac-VHT40	26.00	27.00	29.50
	802.11ac-VHT80	25.00	26.00	28.50
	802.11ax-HE20	23.00	24.00	26.50
	802.11ax-HE40	26.00	27.00	29.50
	802.11ax-HE80	25.00	26.00	28.50
	802.11ax-HE160	21.00	22.00	24.50

Note: WLAN2.4GHz/WLAN5GHz all support SISO/MIMO mode, we only chose MIMO tune up power to perform MPE calculation conservatively for MIMO power is higher.

<For Beamforming mode>

<2.4GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.1+2
2.4GHz	802.11b	27.50
	802.11g	27.00
	802.11n-HT20	24.00
	802.11n-HT40	19.00
	802.11ax-HE20	24.00
	802.11ax-HE40	19.00

<5GHz WLAN >

Mode		Maximum Average Power (dBm)
		Ant.1+2
5.2GHz	802.11a	26.00
	802.11n-HT20	26.00
	802.11n-HT40	28.00
	802.11ac-VHT20	26.00
	802.11ac-VHT40	28.00
	802.11ac-VHT80	20.00
	802.11ax-HE20	26.00
	802.11ax-HE40	28.00
	802.11ax-HE80	20.00
5.3GHz	802.11a	20.00
	802.11n-HT20	21.00
	802.11n-HT40	22.00
	802.11ac-VHT40	22.00



	802.11ac-VHT80	18.00
	802.11ax-HE20	20.00
	802.11ax-HE40	22.00
	802.11ax-HE80	18.00
	802.11ax-HE160	16.00
5.5GHz	802.11a	20.00
	802.11n-HT20	20.00
	802.11n-HT40	22.00
	802.11ac-VHT20	20.00
	802.11ac-VHT40	22.00
	802.11ac-VHT80	22.00
	802.11ax-HE20	20.50
	802.11ax-HE40	22.00
	802.11ax-HE80	22.00
802.11ax-HE160	19.00	
5.8GHz	802.11a	27.00
	802.11n-HT20	28.00
	802.11n-HT40	27.00
	802.11ac-VHT20	27.00
	802.11ac-VHT40	27.00
	802.11ac-VHT80	23.00
	802.11ax-HE20	28.00
	802.11ax-HE40	27.00
802.11ax-HE80	23.00	
5.9GHz	802.11a	23.00
	802.11n-HT20	23.00
	802.11n-HT40	27.00
	802.11ac-VHT20	23.00
	802.11ac-VHT40	27.00
	802.11ac-VHT80	25.50
	802.11ax-HE20	24.00
	802.11ax-HE40	27.00
	802.11ax-HE80	25.50
802.11ax-HE160	22.00	



4. RF Exposure Limit Introduction

According to ANSI/IEEE C95.1-1992, the criteria listed in Table 1 shall be used to evaluate the environmental impact of human exposure to radio frequency (RF) radiation as specified in §1.1310.

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm ²)	Averaging time (minutes)
(A) Limits for Occupational/Controlled Exposures				
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	6
(B) 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

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$S = \frac{PG}{4\pi R^2}$$

Where:

S = Power Density

P = Output Power at Antenna Terminals

G = Gain of Transmit Antenna (linear gain)

R = Distance from Transmitting Antenna



5. Radio Frequency Radiation Exposure Evaluation

5.1. Standalone Power Density Calculation

<CDD/MIMO mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
2.4GHz WLAN	2412.0	2.50	30.00	32.500	1778.279	0.354	1.000	0.354
5.2GHz WLAN	5180.0	3.50	30.00	33.500	2238.721	0.446	1.000	0.446
5.3GHz WLAN	5260.0	3.50	23.98	27.480	559.758	0.111	1.000	0.111
5.5GHz WLAN	5500.0	3.50	23.98	27.480	559.758	0.111	1.000	0.111
5.8GHz WLAN	5745.0	3.50	30.00	33.500	2238.721	0.446	1.000	0.446
5.9GHz WLAN	5845.0	3.50	29.50	33.000	1995.262	0.397	1.000	0.397

<Beamforming mode>

Band	Frequency (MHz)	Antenna Gain (dBi)	Maximum Power (dBm)	Maximum EIRP (dBm)	Average EIRP (mW)	Power Density at 20cm (mW/cm ²)	Limit (mW/cm ²)	Power Density / Limit
2.4GHz WLAN	2412.0	5.51	27.50	33.010	1999.862	0.398	1.000	0.398
5.2GHz WLAN	5180.0	6.51	28.00	34.510	2824.880	0.562	1.000	0.562
5.3GHz WLAN	5260.0	6.51	22.00	28.510	709.578	0.141	1.000	0.141
5.5GHz WLAN	5500.0	6.51	22.00	28.510	709.578	0.141	1.000	0.141
5.8GHz WLAN	5745.0	6.51	28.00	34.510	2824.880	0.562	1.000	0.562
5.9GHz WLAN	5845.0	6.51	27.00	33.510	2243.882	0.447	1.000	0.447

Note:

1. For conservativeness, the lowest frequency of each band is used to determine the MPE limit of that band.
2. Chose the maximum power to do MPE analysis.
3. The gain calculation method of WLAN beamforming mode is referenced to KDB 662911.
4. According to the EUT characteristic, WLAN2.4GHz and WLAN 5GHz cannot transmit simultaneously.

Conclusion:

According to 47 CFR §2.1091, the RF exposure analysis concludes that the RF Exposure is FCC compliant.

-----THE END-----