

FCC RF EXPOSURE REPORT

FCC ID: 2AF5PMG8702

Project No. : 1908C159A
Equipment : DOCSIS 3.1 Cable Modem plus AC3200 Router
Brand Name : motorola
Test Model : MG8702XY
Series Model : N/A
Applicant : MTRLC LLC
Address : 225 Franklin St. 26th Floor, Boston, MA 02110
Manufacturer : MTRLC LLC
Address : 225 Franklin St. 26th Floor, Boston, MA 02110
Date of Receipt : Aug. 20, 2019
May 13, 2020
Date of Test : Aug. 26, 2019 ~ Oct. 24, 2019
May 14, 2020 ~ Jul. 14, 2020
Issued Date : Aug. 27, 2020
Report Version : R00
Test Sample : Engineering Sample No.: DG19082034 and DG20200512124
Standard(s) : FCC Guidelines for Human Exposure IEEE C95.1
FCC Title 47 Part 2.1091, OET Bulletin 65 Supplement C

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

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REPORT ISSUED HISTORY

Report Version	Description	Issued Date
R00	Compared with original report (BTL-FCCP-3-1908C159), added the UNII-2A & UNII-2C mode. In this report only added the data for UNII-2A & UNII-2C mode. Other are kept the same.	Aug. 27, 2020

1. TEST FACILITY

The test facilities used to collect the test data in this report is at the location of No.3,Jinshagang 1st Road, Shixia, Dalang Town, Dongguan, Guangdong, China.
BTL's Test Firm Registration Number for FCC: 357015
BTL's Designation Number for FCC: CN1240

2. MPE CALCULATION METHOD

Calculation Method of RF Safety Distance:

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

where:

S = power density

P = power input to the antenna

G = power gain of the antenna in the direction of interest relative to an isotropic radiator

R = distance to the center of radiation of the antenna.

Antenna Specification:

For 2.4GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Internal	N/A	3.00
2	N/A	N/A	Internal	N/A	3.00
3	N/A	N/A	Internal	N/A	3.00
4	N/A	N/A	Internal	N/A	3.00

Note:

(1) For Non Beamforming function:

This EUT supports CDD, and all antennas have the same gain, Directional gain = G_{ANT} +Array Gain, where Array Gain is as follows:

For power spectral density measurements, $N_{ANT} = 4$, $N_{SS} = 1$.

So Directional gain = $G_{ANT} + \text{Array Gain} = G_{ANT} + 10 \log (N_{ANT}/ N_{SS}) \text{ dB} = 3.00 + 10 \log (4/1) \text{ dBi} = 9.02$. Then, the power spectral density limit is $8 - 9.02 + 6 = 4.98$.

For power measurements, Array Gain = 0 dB ($N_{ANT} \leq 4$), so the Directional gain=3.00.

(2) For Beamforming function, Beamforming Gain: 6.00 dB.

So Directional gain = $6.00 + 3.00 = 9.00$. Then, output power limit is $30 - 9.00 + 6 = 27.00$.

For 5GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	Internal	N/A	3.00
2	N/A	N/A	Internal	N/A	3.00
3	N/A	N/A	Internal	N/A	3.00
4	N/A	N/A	Internal	N/A	3.00

Note:

(1) For Non Beamforming function:

This EUT supports CDD, and all antennas have the same gain, Directional gain = $G_{ANT} + \text{Array}$

For power spectral density measurements, $N_{ANT} = 4$, $N_{SS} = 1$.

So Directional gain = $G_{ANT} + \text{Array Gain} = G_{ANT} + 10 \log(N_{ANT}/N_{SS}) \text{ dB} = 3.00 + 10 \log(4/1) \text{ dBi} = 9.02$.

Then, the UNII-1 power spectral density limit is $17 - (9.02 - 6) = 13.98$, the UNII-2A and UNII-2C power spectral density limit is $11 - (9.02 - 6) = 7.98$, the UNII-3 power spectral density limit is $30 - 9.02 + 6 = 26.98$.

For power measurements, Array Gain = 0 dB ($N_{ANT} \leq 4$), so the Directional gain = 3.00.

(2) For Beamforming function, Beamforming Gain: 6.00 dB.

So Directional gain = $6.00 + 3.00 = 9.00$. Then, UNII-1 and UNII-3 output power limit is

 $30 - (9.00 - 6.00) = 27.00$, UNII-2A and UNII-2C output power limit is $24 - (9.00 - 6.00) = 21.00$.

3. TEST RESULTS

For 2.4GHz Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.00	1.9953	29.94	986.2795	0.25069	1	Complies

For 2.4GHz Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.00	7.9433	26.64	461.3176	0.46680	1	Complies

For 5GHz UNII-1 Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.00	1.9953	26.79	477.5293	0.12138	1	Complies

For 5GHz UNII-2A Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.00	1.9953	23.49	223.3572	0.05677	1	Complies

For 5GHz UNII-2C Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.00	1.9953	23.31	214.2891	0.05447	1	Complies

For 5GHz UNII-3 Non Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
3.00	1.9953	28.73	746.4488	0.18973	1	Complies

For 5GHz UNII-1 Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.00	7.9433	26.01	399.0249	0.40377	1	Complies

For 5GHz UNII-2A Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.00	7.9433	20.97	125.0259	0.12651	1	Complies

For 5GHz UNII-2C Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.00	7.9433	20.7	117.4898	0.11889	1	Complies

For 5GHz UNII-3 Beamforming:

Directional Gain (dBi)	Directional Gain (numeric)	Max. Output Power (dBm)	Max. Output Power (mW)	Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
9.00	7.9433	26.77	475.3352	0.48098	1	Complies

For the max simultaneous transmission MPE:

Power Density (S) (mW/cm ²)	Power Density (S) (mW/cm ²)	Total	Limit of Power Density (S) (mW/cm ²)	Test Result
2.4GHz	5GHz			
0.46680	0.48098	0.94778	1	Complies

Note: The calculated distance is 25 cm.

End of Test Report