FCC RF EXPOSURE REPORT

FCC ID: 2AF5PMGMT77

Project No.	:	1711C015B
Equipment	:	1) 24x8 Cable Modem plus AC1900 Router with Voice 2) 24x8 Cable Modem plus AC1900 Router
Brand Name	:	Motorola
Test Model	:	1) MT7711XY (where X can be A, B, C, D or blank, and Y can be A, B, C, D, or blank) The optional suffixes X and Y for identical hardware models for marketing purposes only)
Series Model	:	2) MG7700XY (where X can be A, B, C, D or blank, and Y can be A, B, C, D, or blank) The optional suffixes X and Y for identical hardware models for marketing purposes only)
Applicant	:	MTRLC LLC
Address	:	225 Franklin Street, 26th Floor, Boston, Massachusetts, United States
Manufacturer	:	MTRLC LLC
Address	:	225 Franklin Street, 26th Floor, Boston, Massachusetts, United States
Date of Receipt	:	Nov. 02, 2017 Mar. 13, 2020
Date of Test	:	Nov. 02, 2017 ~ Dec. 20, 2017 Mar. 13, 2020 ~ Apr. 16, 2020
Issued Date	:	Jun. 01, 2020
Report Version	:	R00
Test Sample	:	Engineering Sample No.: DG2020031840
Standard(s)	:	FCC Guidelines for Human Exposure IEEE C95.1 & FCC Part 2.1091 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	Original Issue	Jun. 01, 2020

1. 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

Table for Filed Antenna:
For 2.4GHz:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	u.fl	3
2	N/A	N/A	PCB	u.fl	3
3	N/A	N/A	PCB	u.fl	3

Note:
(1) The EUT supports the antenna with TX and RX diversity functions.
For IEEE 802.11b/g mode (1TX/1RX):
Ant. 1, Ant. 2 and Ant. 3 support transmit and receive functions, but only one of them will be used at one time. The Ant. 1 generated the worst case, so it was selected to test and record in the report.
For IEEE 802.11n mode (3TX/3RX):
Ant. 1, Ant. 2 and Ant. 3 can be used as transmitting/receiving antenna.
Ant. 1, Ant. 2 and Ant. 3 could transmit/receive simultaneously.
(2) Antenna Gain=3 dBi. This EUT supports MIMO 3X3, any transmit signals are correlated with each other, so Directional gain =G_{ANT}+10log(N)dBi, that is Directional gain=3+10log(3)dBi=7.77. So, the out power limit is 30-7.77+6=28.23, the power density limit is 8-7.77+6=6.23.

For 5GHz UNII-1 and UNII-3:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	u.fl	3
2	N/A	N/A	PCB	u.fl	3
3	N/A	N/A	PCB	u.fl	3

Note:
(1) The EUT supports the antenna with TX and RX diversity functions.
For IEEE 802.11a mode (1TX/1RX):
Ant. 1, Ant. 2 and Ant. 3 support transmit and receive functions, but only one of them will be used at one time. The Ant. 1 generated the worst case, so it was selected to test and record in the report.
For IEEE 802.11n20/n40/ac20/ac40/ac80 mode (3TX/3RX):
Ant. 1, Ant. 2 and Ant. 3 can be used as transmitting/receiving antenna.
Ant. 1, Ant. 2 and Ant. 3 could transmit/receive simultaneously.
(2) Antenna Gain=3 dBi. This EUT supports MIMO 3X3, any transmit signals are correlated with each other, so Directional gain = G_{ANT}+10log(N)dBi, that is Directional gain =3+10log(3)dBi=7.77. So, the UNII-1, UNII-3 output power limit is 30-7.77+6=28.23.
The UNII-1 power density limit is 17-7.77+6=15.23, the UNII-3 power density limit is 30-7.77+6=28.23.

For 5GHz UNII-2A and UNII-2C:

Ant.	Brand	Model Name	Antenna Type	Connector	Gain (dBi)
1	N/A	N/A	PCB	u.fl	2.8
2	N/A	N/A	PCB	u.fl	2.8
3	N/A	N/A	PCB	u.fl	2.8

Note:

1) Antenna Gain=2.8dBi. This EUT supports MIMO 3X3, any transmit signals are correlated with each other, so Directional gain = $G_{Ant.}$+10log(N)dBi, that is Directional gain=2.8+10log(3)dBi=7.57.
   So the output power limit is 24-(7.57-6)=22.43, the power spectral density limit is 11-(7.57-6)=9.43.
2) Beamforming Gain: 4.7dB. So the Directional gain = 4.7+2.8 = 7.5 dBi. So the output power limit is 24-(7.5-6)=22.50, the power spectral density limit is 11-(7.5-6)=9.50.

2. TEST RESULTS

For 2.4GHz:

Antenna Gain (dBi)	Antenna Gain (numeric)	Max. Average Output Power (dBm)	Max. Average Output Power (mW)	Power Density (S) (mW/cm^2)	Limit of Power Density (S) (mW/cm^2)	Test Result
3	1.9953	19.87	97.0510	0.03854	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
7.77	5.9841	22.10	162.1810	0.19317	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
7.57	5.7148	22.21	166.3413	0.18921	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
7.57	5.7148	22.16	164.4372	0.18705	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
7.77	5.9841	27.54	567.5446	0.67601	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
7.77	5.9841	22.15	164.0590	0.19541	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
7.50	5.6234	22.09	161.8080	0.18111	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
7.50	5.6234	22.02	159.2209	0.17822	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
7.77	5.9841	27.57	571.4786	0.68069	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			
0.03854	0.68069	0.719	1	Complies

Note: The calculated distance is 20 cm.

End of Test Report