

RF Exposure Evaluation declaration

Product Name : Active Mobile Gateway-with Comm
Trade Name : Omnitrac
Model No. : CV90-JE103
FCC ID. : 2AE8ZAMGC

Applicant : Omnitrac, LLC
Address : 9276 Scranton Road, Suite 200 San Diego
California 92121 USA

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Report Version : V1.0



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1. RF Exposure Evaluation

1.1. Limits

According to FCC 1.1310: The criteria listed in the following table shall be used to evaluate the environment impact of human exposure to radio frequency (RF) radiation as specified in 1.1307(b)

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)
(A) Limits for Occupational/ Control Exposures				
300-1500	--	--	F/300	6
1500-100,000	--	--	5	6
(B) Limits for General Population/ Uncontrolled Exposures				
300-1500	--	--	F/1500	6
1500-100,000	--	--	1	30

F= Frequency in MHz

Friis Formula

Friis transmission formula: $P_d = (P_{out} \cdot G) / (4 \cdot \pi \cdot r^2)$

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

P_d is the limit of MPE, 1 mW/cm². If we know the maximum gain of the antenna and the total power input to the antenna, through the calculation, we will know the distance r where the MPE limit is reached.

1.2. Test Procedure

Software provided by client enabled the EUT to transmit and receive data at lowest, middle and highest channel individually.

The temperature and related humidity: 18°C and 78% RH.

1.3. Test Result of RF Exposure Evaluation

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

2.4G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.87 dBi or 1.94dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11b (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
1	2412	242.661	0.0937
6	2437	154.882	0.0598
11	2462	159.588	0.0616

IEEE 802.11g (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
1	2412	257.040	0.0992
6	2437	490.908	0.1895
11	2462	279.254	0.1078

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

2.4G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.87 dBi or 1.94dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11n (20MHz) (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
1	2412	311.172	0.1201
6	2437	484.172	0.1869
11	2462	309.742	0.1195

IEEE 802.11n (40MHz) (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
3	2422	192.753	0.0744
6	2437	324.340	0.1252
9	2452	154.882	0.0598

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.81 dBi or 2.40 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11a (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	50.583	0.024
40	5220	51.404	0.025
44	5240	36.560	0.017
52	5260	52.723	0.025
60	5300	59.566	0.028
64	5320	32.434	0.015
100	5500	27.290	0.013
116	5580	77.983	0.037
140	5700	16.482	0.008
149	5745	58.479	0.028
157	5785	53.088	0.025
165	5825	54.702	0.026

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.81 dBi or 2.40 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (20MHz) (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
36	5180	50.234	0.024
40	5220	51.168	0.024
44	5240	37.411	0.018
52	5260	76.736	0.037
60	5300	61.518	0.029
64	5320	29.648	0.014
100	5500	23.014	0.011
116	5580	73.451	0.035
140	5700	21.528	0.010
149	5745	55.463	0.026
157	5785	53.827	0.026
165	5825	54.450	0.026

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.81 dBi or 2.40 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (40MHz) (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
38	5190	19.588	0.009
46	5230	35.727	0.017
54	5270	52.360	0.025
62	5310	16.107	0.008
102	5510	14.555	0.007
110	5550	74.302	0.035
134	5670	36.308	0.017
151	5755	62.374	0.030
159	5795	57.016	0.027

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

5G Antenna Gain: The maximum Gain measured in fully anechoic chamber is 3.81 dBi or 2.40 dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

IEEE 802.11ac (80MHz) (ANT 0)			
WLAN Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
42	5210	17.865	0.009
58	5290	14.555	0.007
106	5530	16.788	0.008
122	5610	66.989	0.032
155	5775	60.395	0.029

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

BT 2.0

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.87 dBi or 1.94dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

GFSK			
Bluetooth Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
00	2402	2.495	0.0010
39	2441	2.786	0.0011
78	2480	2.871	0.0011

$\pi/4$ DQPSK			
Bluetooth Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
00	2402	1.941	0.0008
39	2441	2.377	0.0009
78	2480	2.427	0.0009

8DQPSK			
Bluetooth Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
00	2402	2.023	0.0008
39	2441	2.553	0.0010
78	2480	2.582	0.0010

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

BT 4.0

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Antenna Gain

Antenna Gain: The maximum Gain measured in fully anechoic chamber is 2.87 dBi or 1.94dBi in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

GFSK			
Bluetooth Function			
Channel	Channel Frequency (MHz)	Output Power to Antenna (mW)	Power Density at R = 20 cm (mW/cm ²)
00	2402	1.914	0.0007
19	2440	2.109	0.0008
39	2480	2.188	0.0008

The power density Pd (4th column) at a distance of 20 cm calculated from the Friis transmission formula is far below the limit of 1 mW/cm².

WCDMA Band 2

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 1.92 dBi or 1.56 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
1852.4	24.00	251.19	22.96	197.70	0.078	1.000
1880.0	24.00	251.19	22.95	197.24	0.078	1.000
1907.6	24.00	251.19	23.02	200.45	0.078	1.000

WCDMA Band 4

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 2.40 dBi or 1.74 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
1712.4	24.00	251.19	22.45	175.79	0.087	1.000
1732.6	24.00	251.19	22.57	180.72	0.087	1.000
1752.6	24.00	251.19	23.01	199.99	0.087	1.000

WCDMA Band 5

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is -0.01 dBi or 1.00 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
826.4	24.00	251.19	22.86	193.20	0.050	0.551
836.6	24.00	251.19	22.86	193.20	0.050	0.558
846.6	24.00	251.19	22.98	198.61	0.050	0.564

CDMA/1xEVDO BC0

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is -0.01 dBi or 1.00 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
850.0	24.00	251.19	23.18	207.97	0.078	0.567

CDMA/1xEVDO BC1

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 1.92 dBi or 1.56 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
1900.0	24.00	251.19	23.49	223.36	0.078	1.000

CDMA BC10

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 0.08 dBi or 1.02 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
750.0	24.00	251.19	22.85	192.75	0.051	0.500

LTE Band 2

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 1.92 dBi or 1.56 in linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
1850.7	24.00	251.19	23.23	210.38	0.078	1.000
1880.0	24.00	251.19	23.28	212.81	0.078	1.000
1908.5	24.00	251.19	23.07	202.77	0.078	1.000

LTE Band 4

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 2.40 or 1.74 linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
1711.5	24.00	251.19	23.04	201.37	0.087	1.000
1732.5	24.00	251.19	23.02	200.45	0.087	1.000
1753.5	24.00	251.19	23.05	201.84	0.087	1.000

LTE Band 5

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is -0.01 or 1.00 linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
829.0	24.00	251.19	22.91	195.43	0.050	0.553
836.5	24.00	251.19	22.89	194.54	0.050	0.558
847.5	24.00	251.19	22.91	195.43	0.050	0.565

LTE Band 12

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 0.08 or 1.02 linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
701.5	24.00	251.19	23.16	207.01	0.051	0.468
707.5	24.00	251.19	23.24	210.86	0.051	0.472
715.3	24.00	251.19	23.10	204.17	0.051	0.477

LTE Band 17

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 0.08 or 1.02 linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
706.5	24.00	251.19	23.30	213.80	0.051	0.471
710.0	24.00	251.19	23.14	206.06	0.051	0.473
711.0	24.00	251.19	23.09	203.70	0.051	0.474

LTE Band 25

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is 1.92 or 1.56 linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
1851.5	24.00	251.19	23.25	211.35	0.078	1.000
1882.5	24.00	251.19	23.38	217.77	0.078	1.000
1912.5	24.00	251.19	23.17	207.49	0.078	1.000

LTE Band 26

Antenna Gain

Based on the Maximum Conducted Output Power, the usable maximum antenna gain is -0.01 or 1.00 linear scale.

Output Power into Antenna & RF Exposure Evaluation Distance:

Channel Frequency (MHz)	Maximum Output Power by manufacturer's declaration		Conducted Output Power by Testing		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
	(dBm)	(mW)	(dBm)	(mW)		
815.5	24.00	251.19	22.95	197.24	0.050	0.544
831.5	24.00	251.19	23.00	199.53	0.050	0.554
846.5	24.00	251.19	22.95	197.24	0.050	0.564

Collocation Power Density

Product	Active Mobile Gateway-with Comm
Test Mode	Transmit Mode
Test Condition	RF Exposure Evaluation

Power Density for WiFi 2.4GHz (mW/cm ²)	Power Density for 3G (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.1895	0.102	0.2915	1.0000

Power Density for WiFi 5GHz (mW/cm ²)	Power Density for 3G (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.0370	0.102	0.1390	1.0000

Power Density for BT 2.0 (mW/cm ²)	Power Density for 3G (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.0011	0.102	0.1031	1.0000

Power Density for BT 4.0 (mW/cm ²)	Power Density for 3G (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.0008	0.102	0.1028	1.0000

Power Density for WiFi 2.4GHz (mW/cm ²)	Power Density for LTE (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.1895	0.109	0.2985	1.0000

Power Density for WiFi 5GHz (mW/cm ²)	Power Density for LTE (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.0370	0.109	0.1460	1.0000

Power Density for BT 2.0 (mW/cm ²)	Power Density for LTE (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.0011	0.109	0.1101	1.0000

Power Density for BT 4.0 (mW/cm ²)	Power Density for LTE (mW/cm ²)	Collocation Power Density (mW/cm ²)	Limit (mW/cm ²)
0.0008	0.109	0.1098	1.0000