

MPE Report

Applicant : Meter Inc
Product Type : Meter wireless access point
Trade Name : Meter
Model Number : MW03, MW04
Applicable Standard : IEEE Std.C95.1
47 CFR § 2.1091 / 47 CFR § 1.1310
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Taiwan Accreditation Foundation accreditation number: 1330
Test Firm MRA designation number: TW0010

Note:

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Revision History

Rev.	Issued Date	Revisions	Revised By
00	Jun. 24, 2021	Initial Issue	Nicole Chu
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1. Reference Applicable Standard

Standard	Description	Version
IEEE C95.1	American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 KHz to 100 GHz, New York.	1992
47 CFR Part §2.1091	Radiofrequency radiation exposure evaluation: mobile devices.	-
47 CFR Part §1.1310	Radiofrequency radiation exposure limits.	-



2. Description of Equipment under Test (EUT)

Applicant	Meter Inc 148 Townsend Street, San Francisco, California 94107, United States	
Manufacturer	Meter Inc 148 Townsend Street, San Francisco, California 94107, United States	
Product Type	Meter wireless access point	
Trade Name	Meter	
Model Number	MW03, MW04	
FCC ID	2AVVV-MW03	
Class II Permissive Change	Add the model number, MW04. MW04 has a scanning function while MW03 does not. The rest are identical.	
Frequency Range	Operate Band	Frequency Range (MHz)
	IEEE 802.11b / 802.11g / 802.11n 2.4 GHz 20 MHz (64QAM/256QAM)	2412 - 2462
	IEEE 802.11n 2.4 GHz 40 MHz (64QAM/256QAM)	2422 - 2452
	IEEE 802.11a U-NII Band I	5180 - 5240
	IEEE 802.11a U-NII Band III	5745 - 5825
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band I	5180 - 5240
	IEEE 802.11n 5 GHz / 802.11ac 20 MHz U-NII Band III	5745 - 5825
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band I	5190 - 5230
	IEEE 802.11n 5 GHz / 802.11ac 40 MHz U-NII Band III	5755 - 5795
	IEEE 802.11ac 80 MHz U-NII Band I	5210
	IEEE 802.11ac 80 MHz U-NII Band III	5775



Antenna Information	Band	Antenna	Model	Type	Frequency (MHz)	Max. Gain (dBi)	
	2.4 GHz	ANT-0	5718A0346300	Metal PIFA Antenna	2412-2462	2.86	
		ANT-1	5718A0347300	Metal PIFA Antenna	2412-2462	3.12	
		ANT-2	5718A0348300	Metal PIFA Antenna	2412-2462	3.14	
		ANT-3	5718A0349300	Metal PIFA Antenna	2412-2462	3.29	
		G _{ANT}				3.11	
		Directional Gain				9.13	
	5 GHz	ANT-0	5718A0350300	Metal PIFA Antenna	5150-5250	4.78	
					5725-5850	5.07	
		ANT-1	5718A0351300	Metal PIFA Antenna	5150-5250	4.61	
					5725-5850	5.50	
		ANT-2	5718A0352300	Metal PIFA Antenna	5150-5250	4.31	
					5725-5850	5.36	
		ANT-3	5718A0353300	Metal PIFA Antenna	5150-5250	4.15	
					5725-5850	5.84	
		G _{ANT}				5150-5250	4.47
						5725-5850	5.45
		Directional Gain				5150-5250	10.49
						5725-5850	11.47
		Antenna Delivery	IEEE 802.11b / IEEE 802.11g: 4TX (CDD) IEEE 802.11n 2.4GHz 20 MHz / 40 MHz: 4TX (STBC / Beamforming on) IEEE 802.11a: 4TX (CDD) IEEE 802.11ac 20 MHz / 40 MHz / 80 MHz: 4TX (STBC / Beamforming on)				
RF Evaluation		0.395 mW/cm ²					
Temperature Range	0 ~ +50°C						

The above equipment was tested by A Test Lab Techno Corp. For compliance with the requirements set forth in 47 CFR § 2.1091 / 47 CFR § 1.1310. The results of testing in this report apply only to the product/system, which was tested. Other similar equipment will not necessarily produce the same results due to production tolerance and measurement uncertainties.



3. *Human Exposure Assessment*

Due to the design and installation of this product, it is not possible to conduct SAR evaluation. This is because client either manufactures or supplies the antenna(s) that will be used in the installation of this product. Therefore, this product will be evaluated as a mobile device per 47 CFR § 1.1310 titled "Radiofrequency radiation exposure limits", generally referred to as MPE limits.

In 47 CFR § 2.1091, paragraph (b) defines a mobile device as "a transmitting device designed to be used in other than fixed locations and to generally be used in such a way that a separation distance of at least 20 cm is normally maintained between the transmitter's radiating structure(s) and the body of the user or nearby persons. " This product is intended to be installed into a vehicle such that the unit is physically secured at one location. In the installation guide supplied with the product,

Client has made the following statement: "IMPORTANT: To meet the FCC's RF Exposure Guidelines, the antenna should be installed so there is at least 20 cm of separation between the body of the user and nearby persons and the antenna". Based on the installation of the transceiver and the antenna, the transmitters radiating structure is more than 20 cm from the user. Thus, this product is a "mobile device" as defined in section § 2.1091 paragraph (b).

Exposure evaluation

$$S_{eirp} = \frac{EIRP}{4\pi d^2} = \frac{PG}{4\pi d^2} (W / m^2)$$

Where

S: is the input power (W);

G: is the antenna gain;

d : is the distance between antennas and evaluation point (m).



4. Power Density Limit – RF Exposure Evaluation

Thv In 47 CFR § 1.1310, use of the device as based upon the user's awareness and ability to exercise control over human exposure. The two categories defined are Occupational / Controlled Exposure and General Population / Uncontrolled. These two categories are defined as follow:

Limits for General Population / Uncontrolled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
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 / 1,500	30
1,500-100,000	-	-	1.0	30
Limits for Occupational / Controlled Exposure				
Frequency Range (MHz)	Electric Field Strength (E) (V/m)	Magnetic Field Strength (H) (A/m)	Power Density (S) (mW/cm ²)	Averaging Time E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1,842 / f	4.89 / f	(900 / f ²)*	6
30-300	61.4	0.163	1.0	6
300-1,500	-	-	F / 300	6
1,500-100,000	-	-	5	6

4.1 Conducted Power

The conducted power turn-up tolerance reference manufacturer specification.

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)				
			ANT-0	ANT-1	ANT-2	ANT-3	ANT-0+1+2+3
IEEE 802.11b	1M	2412.0	17.01	17.75	18.11	17.91	23.73
		2437.0	17.05	17.87	18.15	17.57	23.70
		2462.0	17.45	17.67	18.16	18.03	23.86
IEEE 802.11g	6M	2412.0	15.40	15.84	16.64	16.44	22.13
		2437.0	15.36	15.73	16.38	16.28	21.98
		2462.0	15.10	16.12	15.80	16.05	21.81
IEEE 802.11n 2.4 GHz 20 MHz (256QAM)	26M	2412.0	15.33	15.97	16.40	16.17	22.01
		2437.0	15.16	15.69	16.16	16.07	21.81
		2462.0	13.75	14.59	14.35	14.54	20.34
IEEE 802.11n 2.4 GHz 40 MHz (256QAM)	54M	2422.0	13.51	14.02	14.50	14.34	20.13
		2437.0	15.89	16.40	16.98	16.96	22.60
		2452.0	13.01	13.59	13.71	13.84	19.57
IEEE 802.11a	6M	5180.0	17.00	16.64	16.11	15.63	22.40
		5200.0	17.16	16.71	16.26	15.71	22.51
		5220.0	17.28	16.75	16.18	15.76	22.55
		5240.0	17.29	16.59	16.14	15.64	22.48
		5745.0	19.41	18.79	19.60	19.81	25.44
		5765.0	19.52	18.93	19.63	19.76	25.49
		5785.0	19.60	19.23	19.71	19.74	25.60
		5805.0	19.44	19.41	19.57	19.61	25.53
		5825.0	19.31	19.35	19.40	19.42	25.39
IEEE 802.11ac 20 MHz	26M	5180.0	18.97	18.54	18.16	17.69	24.39
		5200.0	18.93	18.41	18.10	17.75	24.34
		5220.0	18.95	18.48	17.98	17.61	24.31
		5240.0	19.06	18.32	17.86	17.54	24.25
		5745.0	18.22	17.66	18.57	18.77	24.35
		5765.0	18.27	17.80	18.51	18.64	24.34
		5785.0	18.35	18.01	18.48	18.71	24.42
		5805.0	18.18	18.27	18.38	18.55	24.37
		5825.0	18.09	18.39	18.22	18.23	24.25
IEEE 802.11ac 40 MHz	54M	5190.0	18.67	18.19	17.75	17.36	24.04
		5230.0	18.91	18.35	17.67	17.26	24.11
		5755.0	17.90	17.30	17.92	18.33	23.90
		5795.0	17.89	17.16	17.97	18.26	23.86
IEEE 802.11ac 80 MHz	117.2M	5210.0	14.98	14.49	13.83	13.52	20.26
		5775.0	18.23	17.89	18.26	18.52	24.25

Note: The relevant measured result has the offset with cable loss already.

Beamforming on

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)				
			ANT-0	ANT-1	ANT-2	ANT-3	ANT-0+1+2+3
IEEE 802.11n 2.4 GHz 20 MHz (256QAM)	26M	2412.0	8.90	9.62	10.05	9.71	15.61
		2437.0	8.64	9.25	9.78	9.64	15.37
		2462.0	7.53	8.21	8.25	8.11	14.06
IEEE 802.11n 2.4 GHz 40 MHz (256QAM)	54M	2422.0	7.04	7.59	8.09	7.95	13.71
		2437.0	9.42	10.04	10.62	10.38	16.16
		2452.0	6.58	7.26	7.45	7.49	13.23
IEEE 802.11ac 20 MHz	26M	5180.0	12.46	11.94	11.52	11.04	17.79
		5200.0	12.38	11.88	11.44	11.17	17.76
		5220.0	12.39	11.93	11.28	10.96	17.70
		5240.0	12.47	11.65	11.21	10.88	17.61
		5745.0	11.69	11.16	11.83	12.26	17.77
		5765.0	11.72	11.31	11.79	12.14	17.77
		5785.0	11.69	11.41	11.78	12.13	17.78
		5805.0	11.43	11.58	11.65	12.08	17.71
IEEE 802.11ac 40 MHz	54M	5825.0	11.41	11.77	11.57	11.72	17.64
		5190.0	12.10	11.63	11.11	10.79	17.46
		5230.0	12.31	11.81	11.02	10.61	17.51
		5755.0	11.48	10.79	11.24	11.84	17.37
IEEE 802.11ac 80 MHz	117.2M	5795.0	11.28	10.59	11.41	11.70	17.28
		5210.0	8.42	7.97	7.14	6.94	13.68
		5775.0	11.75	11.34	11.62	11.97	17.70

Note:1. The relevant measured result has the offset with cable loss already.

2. Evaluated high and low data rate, the report record worst case low data rate measurement results.

5. Test Results

Antenna	Band	Frequency (MHz)	Limit (mW)/cm ²	Distance	Max Tune-up Power	ANT Gain	Numeric Gain	Duty Cycle	Power with Duty cycle	Power Density
				(cm)	(dBm)				(mW)	(mW)/cm ²
				[R]	[P]				[P]x[G]	[S]
Wi-Fi Antenna	2.4 GHz	2412-2472	1	20	24.36	3.11	2.05	1	559.09	0.111
	5 GHz U-NII Band I	5180-5240	1	20	24.89	4.47	2.80	1	862.53	0.172
	5 GHz U-NII Band III	5745-5825	1	20	26.10	5.45	3.51	1	1428.35	0.284
Wi-Fi Antenna (Beamforming on)	2.4 GHz	2412-2472	1	20	16.66	9.13	8.18	1	378.98	0.075
	5 GHz U-NII Band I	5180-5240	1	20	18.29	10.49	11.19	1	755.18	0.150
	5 GHz U-NII Band III	5745-5825	1	20	18.28	11.47	14.03	1	944.35	0.188

Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. We used the maximum power to provide MPE results.
3. The Numeric Gain calculated by $10^{(\text{ant. Gain(dBi)} / 10)}$.
4. The MPE results are evaluated by lowest data rate for WLAN.
5. The device operating IEEE 802.11 a/b/g mode is 4TX MIMO / CDD.
6. The device operating IEEE 802.11 ac/n mode is 4TX MIMO / STBC.

Simultaneous Transmitting :

Total MPE = 2.4 GHz MPE + 5 GHz MPE = 0.111 + 0.284 = 0.395 (mW)/cm² < 1 (mW)/cm²

---END---