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MPE Report

Test Report No.	: 1810FS11
Applicant	: Edimax Technology Co., Ltd.
Product Type	: AC1200 Wireless LAN Dual Band Concurrent MU-MIMO Repeater
Trade Name	: EDIMAX
Model Number	: RE-7478RPC
Date of Received	: Jul. 19, 2018
Test Period	: Aug. 23 ~ Sep. 07, 2018
Date of Issued	: Oct. 25, 2018
Test Specification	: ANSI / IEEE Std.C95.1-1992 / IEEE Std. 1528-2013 47 CFR § 2.1091 47 CFR § 1.1310
Location of Test Lab.	: Chang-an Lab.

1. The test operations have to be performed with cautious behavior, the test results are as attached.
2. The test results are under chamber environment of A Test Lab Techno Corp. A Test Lab Techno Corp. does not assume responsibility for any conclusions and generalizations drawn from the test results with regard to other specimens or samples.
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1. Description of Equipment under Test (EUT)

Applicant	Edimax Technology Co., Ltd. No.278, Xinhua 1st Rd., Neihu Dist., Taipei City, Taiwan				
Manufacturer	Edimax Technology Co., Ltd. No.278, Xinhua 1st Rd., Neihu Dist., Taipei City, Taiwan				
Product Type	AC1200 Wireless LAN Dual Band Concurrent MU-MIMO Repeater				
Trade Name	EDIMAX				
Model Number	RE-7478RPC				
FCC ID	NDD9574781803				
Frequency Range	Operate Band			Frequency Range (MHz)	
	IEEE 802.11b / 802.11g			2412 - 2462	
	IEEE 802.11n 2.4 GHz 20 MHz				
	IEEE 802.11n 2.4 GHz 40 MHz			2422 - 2452	
	IEEE 802.11a U-NII Band I			5180 - 5240	
	IEEE 802.11a U-NII Band III			5745 - 5825	
	IEEE 802.11ac / 802.11n 5 GHz 20 MHz U-NII Band I			5180 - 5240	
	IEEE 802.11ac / 802.11n 5 GHz 20 MHz U-NII Band III			5745 - 5825	
	IEEE 802.11ac / 802.11n 5 GHz 40 MHz U-NII Band I			5190 - 5230	
	IEEE 802.11ac / 802.11n 5 GHz 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	ANT	Model	Type	Max. Gain (dBi)	
	ANT-0	ALX17M-222XX2	embedded antenna	2.4 GHz	3.85
				5 GHz	3.17
	ANT-1	ALX17M-222XX3	embedded antenna	2.4 GHz	3.55
				5 GHz	5.89
	G _{ANT}			2.4 GHz	3.70
				5 GHz	4.74
	Directional Gain			2.4 GHz	6.71
				5 GHz	7.65
Antenna Delivery	IEEE 802.11b / IEEE 802.11g: 2TX (MIMO) IEEE 802.11n 2.4GHz 20 MHz / 40 MHz: 2TX (MIMO/Beamforming on) IEEE 802.11a: 2TX (MIMO) IEEE 802.11ac 20 MHz / 40 MHz / 80 MHz: 2TX (MIMO/Beamforming on)				
RF Evaluation	0.535 mW/cm ²				
Temperature Range	0 ~ +40°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



2. 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

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

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.

3. RF Output 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-0+1
IEEE 802.11b	1	2412.0	12.53	12.62	15.59
		2437.0	13.30	13.40	16.36
		2462.0	15.20	15.04	18.13
	2	2437.0	13.28	13.35	16.33
	5.5	2437.0	13.23	13.36	16.31
	11	2437.0	13.21	13.34	16.29
IEEE 802.11g	6	2412.0	14.39	13.71	17.07
		2437.0	20.10	19.65	22.89
		2462.0	17.60	17.34	20.48
	9	2437.0	20.08	19.59	22.85
	12	2437.0	20.05	19.60	22.84
	18	2437.0	20.04	19.63	22.85
	24	2437.0	20.10	19.57	22.85
	36	2437.0	19.87	19.59	22.74
	48	2437.0	19.97	19.60	22.80
	54	2437.0	19.89	19.64	22.78
IEEE 802.11n 2.4 GHz 20 MHz	13	2412.0	14.21	13.37	16.82
		2437.0	20.11	19.93	23.03
		2462.0	17.28	16.51	19.92
	28.8	2437.0	20.09	19.87	22.99
	43.4	2437.0	20.07	19.92	23.01
	57.8	2437.0	20.05	19.90	22.99
	86.6	2437.0	20.06	19.91	23.00
	115.6	2437.0	20.04	19.88	22.97
	130	2437.0	20.05	19.91	22.99
	144.4	2437.0	20.00	19.86	22.94
IEEE 802.11n 2.4 GHz 40 MHz	27	2422.0	14.70	14.77	17.75
		2437.0	19.60	19.58	22.60
		2452.0	18.01	17.46	20.75
	60	2437.0	19.58	19.49	22.55
	90	2437.0	19.51	19.49	22.51
	120	2437.0	19.59	19.52	22.57
	180	2437.0	19.57	19.50	22.55
	240	2437.0	19.55	19.49	22.53
	270	2437.0	19.59	19.50	22.56
	300	2437.0	19.55	19.51	22.54

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

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11a	6	5180.0	15.70	15.19	18.46
		5200.0	15.60	15.35	18.49
		5220.0	15.49	15.54	18.53
		5240.0	15.52	15.45	18.50
		5745.0	20.17	20.22	23.21
		5765.0	20.29	20.21	23.26
		5785.0	19.89	19.98	22.95
		5805.0	19.77	19.86	22.83
		5825.0	19.93	19.88	22.92
	54	5180.0	15.49	15.12	18.32
		5200.0	15.38	15.40	18.40
		5220.0	15.31	15.43	18.38
		5240.0	15.45	15.39	18.43
		5745.0	20.04	20.21	23.14
		5765.0	20.20	20.18	23.20
		5785.0	19.81	19.94	22.89
		5805.0	19.72	19.80	22.77
		5825.0	19.93	19.81	22.88
IEEE 802.11ac 20 MHz	13	5180.0	15.80	16.18	19.00
		5200.0	16.02	15.95	19.00
		5220.0	16.19	15.62	18.92
		5240.0	16.23	15.65	18.96
		5745.0	20.04	20.10	23.08
		5765.0	19.97	20.04	23.02
		5785.0	20.17	20.22	23.21
		5805.0	19.95	19.85	22.91
		5825.0	19.63	19.62	22.64
	173.4	5180.0	15.59	16.05	18.84
		5200.0	15.79	15.61	18.71
		5220.0	16.05	15.49	18.79
		5240.0	16.16	15.47	18.84
		5745.0	20.00	19.85	22.94
		5765.0	19.90	19.97	22.95
		5785.0	20.11	20.04	23.09
		5805.0	19.85	19.70	22.79
		5825.0	19.57	19.49	22.54

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

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11ac 40 MHz	27	5190.0	16.00	16.06	19.04
		5230.0	17.18	16.23	19.74
		5755.0	20.98	20.83	23.92
		5795.0	20.16	20.38	23.28
	400	5190.0	15.61	15.52	18.58
		5230.0	16.59	15.83	19.24
		5755.0	20.89	20.71	23.81
		5795.0	19.70	20.29	23.02
IEEE 802.11ac 80 MHz	58.6	5210.0	15.69	14.67	18.22
		5775.0	20.28	20.56	23.43
	866.6	5210.0	15.61	14.59	18.14
		5775.0	20.19	20.37	23.29

Beamforming on

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11n 2.4 GHz 20 MHz	13	2412.0	10.53	9.95	13.26
		2437.0	17.26	16.55	19.93
		2462.0	13.95	13.40	16.69
	28.8	2437.0	17.20	16.49	19.87
	43.4	2437.0	17.21	16.50	19.88
	57.8	2437.0	17.19	16.49	19.86
	86.6	2437.0	17.22	16.51	19.89
	115.6	2437.0	17.23	16.51	19.90
	130	2437.0	17.25	16.52	19.91
	144.4	2437.0	17.26	16.51	19.91
IEEE 802.11n 2.4 GHz 40 MHz	27	2422.0	11.82	11.41	14.63
		2437.0	16.11	15.66	18.90
		2452.0	14.91	12.97	17.06
	60	2437.0	16.06	15.62	18.86
	90	2437.0	16.01	15.62	18.83
	120	2437.0	16.06	15.66	18.87
	180	2437.0	16.03	15.60	18.83
	240	2437.0	16.07	15.62	18.86
	270	2437.0	16.08	15.60	18.86
	300	2437.0	16.11	15.65	18.90

Band	Data Rate (Mbps)	Frequency (MHz)	Average Conducted power (dBm)		
			ANT-0	ANT-1	ANT-0+1
IEEE 802.11ac 20 MHz	13	5180.0	12.61	12.52	15.58
		5200.0	12.81	12.78	15.81
		5220.0	12.91	12.72	15.83
		5240.0	12.83	12.84	15.85
		5745.0	16.75	16.61	19.69
		5765.0	16.23	16.16	19.21
		5785.0	16.49	15.99	19.26
		5805.0	16.05	15.85	18.96
		5825.0	16.43	16.05	19.25
	173.4	5180.0	12.70	12.02	15.38
		5200.0	12.55	12.61	15.59
		5220.0	12.38	12.59	15.50
		5240.0	12.79	12.61	15.71
		5745.0	16.69	16.61	19.66
		5765.0	16.19	16.15	19.18
		5785.0	16.17	16.03	19.11
		5805.0	16.05	15.81	18.94
		5825.0	15.77	15.97	18.88
IEEE 802.11ac 40 MHz	27	5190.0	13.05	12.58	15.83
		5230.0	13.42	12.98	16.22
		5755.0	17.65	17.50	20.59
		5795.0	17.27	16.92	20.11
	400	5190.0	12.71	12.17	15.46
		5230.0	12.92	12.59	15.77
		5755.0	17.57	17.27	20.43
IEEE 802.11ac 80 MHz	58.6	5795.0	17.04	16.82	19.94
		5210.0	12.05	11.72	14.90
	866.6	5775.0	16.61	16.85	19.74
		5210.0	11.59	11.61	14.61
		5775.0	16.49	16.57	19.54

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



4. Test Results

WLAN Antenna_MIMO										
Band	Data Rate (Mbps)	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	Power with Duty cycle [TP] (mW)	Power Density [S] (mw/cm ²)
IEEE 802.11b	1	2412.0	1	20	18.50	6.71	4.69	1	332.03	0.066
		2437.0	1	20	18.50	6.71	4.69	1	332.03	0.066
		2462.0	1	20	18.50	6.71	4.69	1	332.03	0.066
IEEE 802.11g	6	2412.0	1	20	23.00	6.71	4.69	1	935.78	0.186
		2437.0	1	20	23.00	6.71	4.69	1	935.78	0.186
		2462.0	1	20	23.00	6.71	4.69	1	935.78	0.186
IEEE 802.11n 2.4 GHz 20 MHz	13	2412.0	1	20	23.50	6.71	4.69	1	1049.96	0.209
		2437.0	1	20	23.50	6.71	4.69	1	1049.96	0.209
		2462.0	1	20	23.50	6.71	4.69	1	1049.96	0.209
IEEE 802.11n 2.4 GHz 40 MHz	27	2422.0	1	20	23.00	6.71	4.69	1	935.78	0.186
		2437.0	1	20	23.00	6.71	4.69	1	935.78	0.186
		2452.0	1	20	23.00	6.71	4.69	1	935.78	0.186
IEEE 802.11a	6	5180.0	1	20	19	7.65	5.82	1	462.3	0.092
		5200.0	1	20	19	7.65	5.82	1	462.3	0.092
		5220.0	1	20	19	7.65	5.82	1	462.3	0.092
		5240.0	1	20	19	7.65	5.82	1	462.3	0.092
		5745.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
		5765.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
		5785.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
		5805.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
IEEE 802.11ac 20 MHz	13	5180.0	1	20	19.5	7.65	5.82	1	518.71	0.103
		5200.0	1	20	19.5	7.65	5.82	1	518.71	0.103
		5220.0	1	20	19.5	7.65	5.82	1	518.71	0.103
		5240.0	1	20	19.5	7.65	5.82	1	518.71	0.103
		5745.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
		5765.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
		5785.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
		5805.0	1	20	23.5	7.65	5.82	1	1302.94	0.259
IEEE 802.11ac 40 MHz	27	5190.0	1	20	20	7.65	5.82	1	582	0.116
		5230.0	1	20	20	7.65	5.82	1	582	0.116
		5755.0	1	20	24.5	7.65	5.82	1	1640.3	0.326
		5795.0	1	20	24.5	7.65	5.82	1	1640.3	0.326
IEEE 802.11ac 80 MHz	58.6	5210.0	1	20	18.5	7.65	5.82	1	412.02	0.082
		5775.0	1	20	24	7.65	5.82	1	1461.92	0.291

WLAN Antenna_MIMO_Beamforming on										
Band	Data Rate (Mbps)	Frequency (MHz)	Limit (mw)	Distance [R] (cm)	Max tune-up Power (upper limit) [P] (dBm)	ANT Gain (dBi)	Numeric Gain [G]	Duty Cycle	Power with Duty cycle [TP] (mW)	Power Density [S] (mw/cm ²)
IEEE 802.11n 2.4 GHz 20 MHz	13	2412.0	1	20	20.50	6.71	4.69	1	526.23	0.105
		2437.0	1	20	20.50	6.71	4.69	1	526.23	0.105
		2462.0	1	20	20.50	6.71	4.69	1	526.23	0.105
IEEE 802.11n 2.4 GHz 40 MHz	27	2422.0	1	20	19.50	6.71	4.69	1	418	0.083
		2437.0	1	20	19.50	6.71	4.69	1	418	0.083
		2452.0	1	20	19.50	6.71	4.69	1	418	0.083
IEEE 802.11ac 20 MHz	13 27 13	5180.0	1	20	16	7.65	5.82	1	231.7	0.046
		5200.0	1	20	16	7.65	5.82	1	231.7	0.046
		5220.0	1	20	16	7.65	5.82	1	231.7	0.046
		5240.0	1	20	16	7.65	5.82	1	231.7	0.046
		5745.0	1	20	20	7.65	5.82	1	582	0.116
		5765.0	1	20	20	7.65	5.82	1	582	0.116
		5785.0	1	20	20	7.65	5.82	1	582	0.116
		5805.0	1	20	20	7.65	5.82	1	582	0.116
		5825.0	1	20	20	7.65	5.82	1	582	0.116
IEEE 802.11ac 40 MHz	27	5190.0	1	20	16.5	7.65	5.82	1	259.97	0.052
		5230.0	1	20	16.5	7.65	5.82	1	259.97	0.052
		5755.0	1	20	21	7.65	5.82	1	732.69	0.146
		5795.0	1	20	21	7.65	5.82	1	732.69	0.146
IEEE 802.11ac 80 MHz	58.6	5210.0	1	20	15.5	7.65	5.82	1	206.5	0.041
		5775.0	1	20	20	7.65	5.82	1	582	0.116

Note:

1. Mobile or fixed location transmitters, minimum separation distance is 20 cm, even if calculations indicate MPE distance is less.
2. The Numeric Gain calculated by $10^{(\text{ant. Gain(dBi)} / 10)}$.
3. Each band max power which perform MPE of any configurations.
4. The MPE results are evaluated by lowest data rate for WLAN.
5. The device operating IEEE 802.11 a/b/g/n/ac mode is 2TX MIMO.
6. The device support simultaneous transmission.

Simultaneous Transmitting:

$$\text{Total MPE} = 2.4 \text{ GHz MPE} + 5 \text{ GHz MPE} = 0.209 + 0.326 = 0.535 \text{ mw/cm}^2 < 10 \text{ mw/cm}^2$$