

RF Exposure Evaluation Declaration

Product Name : Mesh Wi-Fi Router
Trade Name : CastleNet
Model No. : EBM522U, EBM522
FCC ID : RK9-EBM522

Applicant : CastleNet Technology Inc.

Address : No. 14, Ln. 141, Sec. 3, Beishen Rd. Shenkeng Dist., New
Taipei City, 22244 Taiwan

Date of Receipt : Apr. 19, 2021
Date of Declaration : Sep. 11, 2021
Report No. : 2140542R-E3032410101
Report Version : V1.0



The declaration results relate only to the samples calculated.

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Manufacturer : CastleNet Technology Inc.

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Model No. : EBM522U, EBM522

FCC ID : RK9-EBM522

EUT Voltage : AC 100~240V, 50/60Hz

Testing Voltage : AC 120V/60Hz


Trade Name : CastleNet

Applicable Standard : FCC 47 CFR Part 2.1091 Radiofrequency radiation exposure evaluation: mobile devices.

Test Lab : Hsin Chu Laboratory

Address : No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 310, Taiwan, R.O.C.
TEL: +886-3-582-8001 / FAX: +886-3-582-8958

Test Result : Complied

Tested By : 

(Clemens Fang / Senior Engineer)

Approved By : 

(Louis Hsu / Deputy Manager)

Revision History

Version	Description	Issued Date
V1.0	Initial issue of report	Sep. 11, 2021

1.1. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required	Test Site
Temperature (°C)	Maximum Conducted Output Power	15 - 35	1
Humidity (%RH)		25 - 75	

Note: Test site information refers to Laboratory Information.

USA : FCC Registration Number: TW3024
Canada : IC Registration Number: 22397-1 / 22397-2 / 22397-3

The address and introduction of DEKRA Testing and Certification Co., Ltd. laboratories can be founded in our

Web site: <http://www.dekra.com.tw>

If you have any comments, please don't hesitate to contact us. Our test sites as below:

Test Laboratory	DEKRA Testing and Certification Co., Ltd.
Address	1. No.372, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C. 2. No.372-2, Sec. 4, Zhongxing Rd., Zhudong Township, Hsinchu County 31061, Taiwan, R.O.C.
Phone number	1. +886-3-582-8001 2. +886-3-582-8001
Fax number	1. +886-3-582-8958 2. +886-3-582-8958
Email address	info.tw@dekra.com
Website	http://www.dekra.com.tw

1.2. List of Test Equipment

Maximum Conducted Output Power / SR12-H

Instrument	Manufacturer	Model No.	Serial No.	Cal. Date	Next Cal. Date
High Speed Peak Power Meter Dual Input	Anritsu	ML2496A	1602004	2020/11/30	2021/11/29
Pulse Power Sensor	Anritsu	MA2411B	1531043	2020/11/30	2021/11/29
EXA Signal Analyzer	Keysight	N9010A	MY51440132	2021/01/25	2022/01/24
Pulse Power Sensor	Anritsu	MA2411B	1531044	2020/11/30	2021/11/29
Power Meter	Keysight	8990B	MY51000248	2021/05/21	2022/05/20
Power Sensor	Keysight	N1923A	MY57240005	2021/05/21	2022/05/20
Spectrum Analyzer	Keysight	N9030B	MY57140404	2021/05/14	2022/05/13
Spectrum Analyzer	Keysight	N9010B	MY57110159	2021/03/29	2022/03/28
Wideband Radio Communication Tester	R&S	CMW500	106071	2021/01/27	2022/01/26
Wireless Conn. Tseter	R&S	CMW500	157118	2020/07/23	2021/07/22
Spectrum Analyzer	Agilent	N9010A	US47140172	2021/05/28	2022/05/27
Signal & Spectrum Analyzer	R&S	FSV40	101049	2021/03/31	2022/03/30

Note: All equipment upon which need to calibrated are with calibration period of 1 year.

1.3. Uncertainty

Test item	Uncertainty
Maximum Conducted Output Power	± 2.26 dB

Determining compliance shall be based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

2. RF Exposure Evaluation

2.1. 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

RF Field Strength Limits for Controlled Use Devices (Controlled Environment)

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-1023	170	180	-	Instantaneous*
0.1-10	-	1.6/ <i>f</i>	-	6**
1.29-10	193/ <i>f</i> 0.5	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ <i>f</i> 0.25	0.3444/ <i>f</i> 0.25	44.72/ <i>f</i> 0.5	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 <i>f</i> 0.25	0.04138 <i>f</i> 0.25	0.6455 <i>f</i> 0.5	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ <i>f</i> 1.2
150000-300000	0.354 <i>f</i> 0.5	9.40 x 10 ⁻⁴ <i>f</i> 0.5	3.33 x 10 ⁻⁴ <i>f</i>	616000/ <i>f</i> 1.2

Note: *f* is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).

Friis Formula

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

Where

P_d = power density in mW/cm^2

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, $1 mW/cm^2$. 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.

2.2. Test Procedure

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

2.3. Test Result of RF Exposure Evaluation

Product	Mesh Wi-Fi Router		
Test Mode	Transmit Mode		
Test Condition	RF Exposure Evaluation		
Date of Test	2021/05/18	Test Site	SR12-H
Temperature (°C)	25.5	Humidity (%RH)	60.0

Antenna Gain: The maximum antenna gain is 3 dBi.

Output Power into Antenna & RF Exposure Evaluation Distance:

WLAN Function 2.4GHz Band					
Mode	Frequency (MHz)	Maximum Conducted Output Power		Maximum Power Density at R = 20 cm (mW/cm ²)	Limit (mW/cm ²)
		dBm	mW		
802.11b (Non-BF Mode)	2412	23.005	199.758	0.079	1
	2437	24.097	256.880	0.102	1
	2462	21.889	154.501	0.061	1
802.11g (Non-BF Mode)	2412	19.340	85.908	0.034	1
	2437	22.449	175.745	0.070	1
	2462	17.636	58.018	0.023	1
802.11ax (20MHz) (Non-BF Mode)	2412	17.920	61.951	0.025	1
	2437	22.488	177.326	0.070	1
	2462	15.576	36.108	0.014	1
802.11ax (40MHz) (Non-BF Mode)	2422	18.091	64.430	0.026	1
	2437	20.610	115.093	0.046	1
	2452	17.431	55.351	0.022	1

Note:

1. The results are evaluated using the maximum power from test report no. 2140542R-E3032110113.
2. The antenna information is from the customer declaration.

Product	Mesh Wi-Fi Router		
Test Mode	Transmit Mode		
Test Condition	RF Exposure Evaluation		
Date of Test	2021/05/15~2021/06/26	Test Site	SR12-H
Temperature(°C)	24.0	Humidity (%RH)	68.0

Antenna Gain: The maximum antenna gain is 4.5 dBi.

Output Power into Antenna & RF Exposure Evaluation Distance:

WLAN Function 5GHz Band					
Mode	Frequency (MHz)	Conducted Output Power		Power Density at R = 20cm (mW/cm ²)	Limit (mW/cm ²)
		dBm	mW		
802.11a (Non-BF Mode)	5180	24.314	270.021	0.151	1
	5220	24.545	284.762	0.160	1
	5240	24.541	284.504	0.160	1
	5260	18.978	79.034	0.044	1
	5300	18.871	77.103	0.043	1
	5320	18.783	75.563	0.042	1
	5500	18.388	68.988	0.039	1
	5580	18.496	70.731	0.040	1
	5700	18.624	72.841	0.041	1
	5745	22.359	172.137	0.097	1
	5785	21.862	153.522	0.086	1
	5825	22.175	165.009	0.093	1
802.11ax (20MHz) (Non-BF Mode)	5180	24.918	310.314	0.174	1
	5220	24.902	309.185	0.173	1
	5240	25.116	324.767	0.182	1
	5260	19.478	88.674	0.050	1
	5300	19.316	85.419	0.048	1
	5320	19.149	82.202	0.046	1
	5500	19.209	83.344	0.047	1
	5580	19.173	82.670	0.046	1
	5700	19.038	80.136	0.045	1
	5745	22.121	162.958	0.091	1
	5785	22.602	182.047	0.102	1
	5825	22.919	195.857	0.110	1

WLAN Function 5GHz Band					
Mode	Frequency (MHz)	Conducted Output Power		Power Density at R = 20cm (mW/cm ²)	Limit (mW/cm ²)
		dBm	mW		
802.11ax (40MHz) (Non-BF Mode)	5190	24.011	251.830	0.141	1
	5230	27.555	569.493	0.319	1
	5270	22.373	172.700	0.097	1
	5310	22.525	178.869	0.100	1
	5510	21.581	143.915	0.081	1
	5550	21.939	156.290	0.088	1
	5670	22.089	161.772	0.091	1
	5755	23.441	220.873	0.124	1
	5795	23.239	210.812	0.118	1
802.11ax (80MHz) (Non-BF Mode)	5210	23.865	243.517	0.137	1
	5290	22.394	173.553	0.097	1
	5530	23.127	205.449	0.115	1
	5610	23.798	239.750	0.134	1
	5775	24.848	305.378	0.171	1
802.11ax (160MHz) (Non-BF Mode)	5250 (Band 1)	23.865	243.517	0.137	1
	5250 (Band 2)	22.394	173.553	0.097	1
	5570	23.127	205.449	0.115	1

Note:

1. The results are evaluated using the maximum power from test report no. 2140542R-E3032110126.
2. The antenna information is from the customer declaration.

WLAN Function 5GHz Band					
Mode	Frequency (MHz)	Conducted Output Power		Power Density at R = 20cm (mW/cm ²)	Limit (mW/cm ²)
		dBm	mW		
802.11ax (20MHz) (BF Mode)	5180	24.918	310.314	0.174	1
	5220	24.902	309.185	0.173	1
	5240	25.116	324.767	0.182	1
	5260	19.478	88.674	0.050	1
	5300	19.316	85.419	0.048	1
	5320	19.149	82.202	0.046	1
	5500	19.209	83.344	0.047	1
	5580	19.173	82.670	0.046	1
	5700	19.038	80.136	0.045	1
	5745	22.121	162.958	0.091	1
	5785	22.602	182.047	0.102	1
	5825	22.919	195.857	0.110	1
802.11ax (40MHz) (BF Mode)	5190	23.916	246.367	0.138	1
	5230	26.364	432.917	0.243	1
	5270	20.312	107.456	0.060	1
	5310	20.224	105.302	0.059	1
	5510	20.225	105.318	0.059	1
	5550	20.205	104.831	0.059	1
	5670	20.225	105.312	0.059	1
	5755	23.441	220.873	0.124	1
5795	23.239	210.812	0.118	1	
802.11ax (80MHz) (BF Mode)	5210	23.865	243.517	0.137	1
	5290	20.296	107.059	0.060	1
	5530	20.380	109.143	0.061	1
	5610	20.402	109.706	0.062	1
	5775	24.713	296.039	0.166	1
802.11ax (160MHz) (Non-BF Mode)	5250 (Band 1)	20.301	107.165	0.060	1
	5250 (Band 2)	20.189	104.442	0.059	1
	5570	20.285	106.794	0.060	1

Note:

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