

RF Exposure Evaluation Declaration

Product Name : Mesh Wi-Fi Router
Trade Name : CastleNet
Model No. : EBM552U, EBM552
FCC ID : RK9-EBM552

Applicant : CastleNet Technology Inc.

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

Date of Receipt : Dec. 29, 2020
Date of Declaration : Mar. 10, 2021
Report No. : 20C1060R-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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FCC ID : RK9-EBM552

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	Mar. 10, 2021

1.1. Test Facility

Ambient conditions in the laboratory:

Items	Test Item	Required	Test Site
Temperature (°C)	Peak 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

Peak 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
Pulse Power Sensor	Anritsu	MA2411B	1531044	2020/11/30	2021/11/29
Power Meter	Keysight	8990B	MY51000248	2020/05/20	2021/05/19
Power Sensor	Keysight	N1923A	MY57240005	2020/05/20	2021/05/19

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

1.3. Uncertainty

Test item	Uncertainty
Peak 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/ f	-	6**
1.29-10	193/ f 0.5	-	-	6**
10-20	61.4	0.163	10	6
20-48	129.8/ f 0.25	0.3444/ f 0.25	44.72/ f 0.5	6
48-100	49.33	0.1309	6.455	6
100-6000	15.60 f 0.25	0.04138 f 0.25	0.6455 f 0.5	6
6000-15000	137	0.364	50	6
15000-150000	137	0.364	50	616000/ f 1.2
150000-300000	0.354 f 0.5	9.40 x 10 ⁻⁴ f 0.5	3.33 x 10 ⁻⁴ f	616000/ f 1.2
Note: f is frequency in MHz. *Based on nerve stimulation (NS). ** Based on specific absorption rate (SAR).				

Friis Formula

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

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	2021/01/25~2021/02/08	Test Site	SR12-H
Temperature (°C)	20.0	Humidity (%RH)	66.0

Antenna Gain: The maximum antenna gain is 4.52dBi.

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	23.964	249.103	0.050	1
	2437	25.035	318.778	0.063	1
	2462	24.290	268.522	0.053	1
802.11g (Non-BF Mode)	2412	18.720	74.482	0.015	1
	2437	25.064	320.956	0.064	1
	2462	19.048	80.317	0.016	1
802.11ax (20MHz) (Non-BF Mode)	2412	19.096	81.207	0.016	1
	2437	24.922	310.596	0.062	1
	2462	19.591	91.013	0.018	1
802.11ax (40MHz) (Non-BF Mode)	2422	18.291	67.466	0.013	1
	2437	19.960	99.090	0.020	1
	2452	18.996	79.366	0.016	1
802.11ax (20MHz) (BF Mode)	2412	18.675	73.713	0.015	1
	2437	25.365	343.978	0.068	1
	2462	19.100	81.292	0.016	1
802.11ax (40MHz) (BF Mode)	2422	18.300	67.614	0.013	1
	2437	20.626	115.492	0.023	1
	2452	19.631	91.848	0.018	1

Note:

1. The results are evaluated using the maximum power from test report no. 20C1060R-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	2021/01/25	Test Site	SR12-H
Temperature(°C)	20.0	Humidity (%RH)	66.0

Antenna Gain: The maximum antenna gain is 5.43dBi.

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	23.791	239.389	0.048	1
	5220	25.385	345.576	0.069	1
	5240	25.391	346.008	0.069	1
	5260	19.566	90.498	0.018	1
	5300	19.617	91.557	0.018	1
	5320	19.540	89.949	0.018	1
	5500	19.611	91.437	0.018	1
	5580	19.533	89.796	0.018	1
	5700	19.720	93.765	0.019	1
	5745	28.290	674.549	0.134	1
	5785	27.101	512.984	0.102	1
	5825	26.691	466.752	0.093	1
802.11ax (20MHz) (Non-BF Mode)	5180	23.176	207.776	0.041	1
	5220	26.115	408.825	0.081	1
	5240	26.166	413.585	0.082	1
	5260	20.026	100.609	0.020	1
	5300	20.090	102.086	0.020	1
	5320	19.893	97.575	0.019	1
	5500	20.092	102.147	0.020	1
	5580	20.123	102.862	0.020	1
	5700	20.306	107.295	0.021	1
	5745	28.535	713.728	0.142	1
	5785	27.681	586.217	0.117	1
	5825	27.161	520.144	0.103	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	20.711	117.780	0.023	1
	5230	24.811	302.764	0.060	1
	5270	22.861	193.235	0.038	1
	5310	20.318	107.602	0.021	1
	5510	19.840	96.382	0.019	1
	5550	23.237	210.696	0.042	1
	5670	21.038	127.012	0.025	1
	5755	26.111	408.387	0.081	1
	5795	24.798	301.837	0.060	1
802.11ax (80MHz) (Non-BF Mode)	5210	19.278	84.685	0.017	1
	5290	19.249	84.126	0.017	1
	5530	20.660	116.416	0.023	1
	5610	22.733	187.624	0.037	1
	5775	22.464	176.378	0.035	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 (20MHz) (BF Mode)	5180	23.276	212.624	0.042	1
	5220	26.347	431.203	0.086	1
	5240	26.290	425.638	0.085	1
	5260	20.506	112.354	0.022	1
	5300	20.533	113.052	0.022	1
	5320	20.392	109.452	0.022	1
	5500	20.132	103.079	0.021	1
	5580	20.238	105.626	0.021	1
	5700	20.305	107.283	0.021	1
	5745	27.705	589.566	0.117	1
	5785	27.586	573.560	0.114	1
	5825	26.418	438.335	0.087	1
802.11ax (40MHz) (BF Mode)	5190	20.946	124.333	0.025	1
	5230	25.032	318.584	0.063	1
	5270	21.760	149.985	0.030	1
	5310	20.140	103.284	0.021	1
	5510	20.126	102.935	0.020	1
	5550	21.836	152.604	0.030	1
	5670	21.554	143.022	0.028	1
	5755	26.516	448.310	0.089	1
	5795	24.666	292.842	0.058	1
802.11ax (80MHz) (BF Mode)	5210	20.273	106.485	0.021	1
	5290	19.431	87.725	0.017	1
	5530	20.618	115.294	0.023	1
	5610	21.710	148.268	0.029	1
	5775	21.705	148.096	0.029	1

Note:

1. The results are evaluated using the maximum power from test report no. 20C1060R-E3032110125.
2. The antenna information is from the customer declaration.