

# Radio Exposure Evaluation Report

FCC ID : KA2R12A1

Equipment : AC1200 SMART ROUTER

Brand Name : D-Link

Model Name : R12

Applicant : D-Link Corporation  
14420 Myford Road Suite 100 Irvine California United States 92606

Manufacturer : D-Link Corporation  
No. 289, Xinhua 3rd Road, Neihu District, Taipei City 114, Taiwan

Standard : 47 CFR FCC Part 2 Subpart J, section 2.1091

The product was received on Aug. 11, 2021, and testing was started from Sep. 01, 2021 and completed on Sep. 09, 2021. We, SPORTON INTERNATIONAL INC. Hsinhua Laboratory, would like to declare that the tested sample has been evaluated in accordance with the procedures given in 47 CFR FCC Part 2 Subpart J, section 2.1091 and shown compliance with the applicable technical standards.

The test results in this variant report apply exclusively to the tested model / sample. Without written approval of SPORTON INTERNATIONAL INC. Hsinhua Laboratory, the test report shall not be reproduced except in full.



Approved by: Jackson Tsai

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Report Template No.: HE1-A1 Ver5.0  
FCC ID: KA2R12A1



## Summary of Test Result

Report Clause	Ref Std. Clause	Test Items	Result (PASS/FAIL)	Remark
2	-	Exposure evaluation	PASS	-

**Declaration of Conformity:**

The test results with all measurement uncertainty excluded are presented in accordance with the regulation limits or requirements declared by manufacturers.

**Comments and Explanations:**

None

**Reviewed by: Sam Tsai**

**Report Producer: Anne Kuo**

# 1 General Description

## 1.1 Information

### 1.1.1 EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5700 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)

### 1.1.2 Antenna Information

Ant.	Brand	Model Name	Antenna Type	Connector	Support
1	LYNwave	AOX21X-051044-00	Dipole antenna	I-PEX	2.4G
2	LYNwave	AOX21X-051044-00	Dipole antenna	I-PEX	2.4G
3	LYNwave	AOX21X-091052-00	Dipole antenna	I-PEX	5G
4	LYNwave	AOX21X-091052-00	Dipole antenna	I-PEX	5G
5	LYNwave	-	Print antenna	N/A	2.4G RX

Ant.	Port	Gain (dBi)	
		2.4G	5G
1	1	4.8	-
2	2	4.8	-
3	1	-	5.3
4	2	-	5.3
5	3	4.1	-

Note 1: The EUT has five antennas.

#### For 2.4GHz function:

For IEEE 802.11 b/g/n mode (2TX/3RX)

Ant. 1 (port 1) and Ant. 2 (port 2) could transmit simultaneously.

Ant. 1 (port 1) and Ant. 2 (port 2) and Ant. 5 (port 3) could receive simultaneously.

#### For 5GHz function:

For IEEE 802.11 a/n/ac mode (2TX/2RX)

Ant. 3 (port 1) and Ant. 4 (port 2) could transmit/receive simultaneously.

### 1.1.3 Table for Permissive Change

This product is an extension of original one reported under Sporton project number: FA181118  
Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
Frequency bands U-NII-2A and U-NII-2C were added	MPE was evaluated

### 1.1.4 Accessories

Accessories				
AC Adapter 1	Brand Name	AMIGO	Model Name	AMS159A-1201000F
	Manufacturer	AMIGO		
	Power Rating	I/P: 100 - 240 Vac, 0.5A, O/P: 12 Vdc, 1 A		
	Power Cord	1.2 meter, non-shielded cable, w/o ferrite core		
AC Adapter 2 (US/NCC Plug)	Brand Name	AMIGO	Model Name	AMS159A-1201000FU
	Manufacturer	AMIGO		
	Power Rating	I/P: 100 - 240 Vac, 0.5A, O/P: 12 Vdc, 1 A		
	Power Cord	1.2 meter, non-shielded cable, w/o ferrite core		
RJ45 Cable	Brand Name	AMIGO	Model Name	NYS4709 REV.0
	Power Cord	1 meter, non-shielded cable		

Reminder: Regarding to more detail and other information, please refer to user manual.

## 1.2 Applicable Standards

According to the specifications of the manufacturer, the EUT must comply with the requirements of the following standards:

- ♦ 47 CFR FCC Part 2 Subpart J, section 2.1091
- ♦ KDB 447498 D04 Interim General RF Exposure Guidance v01

The following reference test guidance is not within the scope of accreditation of TAF.

- ♦ 47 CFR Part 1.1307
- ♦ 47 CFR Part 1.1310

## 1.3 Testing Location

Test Lab. : Sporton International Inc. Hsinhua Laboratory		
<input checked="" type="checkbox"/>	Hsinhua (TAF: 3785)	ADD: No.52, Huaya 1st Rd., Guishan Dist., Taoyuan City 333411, Taiwan (R.O.C.) TEL: 886-3-327-3456 FAX: 886-3-327-0973
Test site Designation No. TW3785 with FCC.		
<input type="checkbox"/>	Wen 33rd.St. (TAF: 3785)	ADD: No.14-1, Ln. 19, Wen 33rd St., Guishan Dist., Taoyuan City 333010, Taiwan (R.O.C.) TEL: 886-3-318-0787 FAX: 886-3-318-0287
Test site Designation No. TW0008 with FCC.		

## 2 Maximum Permissible Exposure

### 2.1 Limit of Maximum Permissible Exposure

(A) 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f <sup>2</sup> )*	6
30-300	61.4	0.163	1.0	6
300-1500	-	-	F/300	6
1500-100,000	-	-	5	6

(B) 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 <sup>2</sup> )	Averaging Time  E  <sup>2</sup> , H  <sup>2</sup> or S (minutes)
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f <sup>2</sup> )*	30
30-300	27.5	0.073	0.2	30
300-1500	-	-	F/1500	30
1500-100,000	-	-	1.0	30

Note: f = frequency in MHz ; \*Plane-wave equivalent power density

#### Multiple Transmitters Condition

Co-location as simultaneously transmitting (co-transmitting) and the evaluation shall be consider that simultaneous transmissions from co-located devices the individual transmitters are evaluated separately. After sum of the individual value (basic restriction / reference level) are measured/calculated also have to under basic restriction / reference level.

Co-transmitting mode: 2.4GHz WLAN+5GHz WLAN Mode

## 2.2 RF Exposure Exempt Measurement

Option	Refer Std.	Exemption Exposure Thresholds (TL)
A	§1.1307(b)(3)(i)(A)	Available maximum time-averaged power is no more than 1 mW
B	§1.1307(b)(3)(i)(B)	$P_{th}(mW) = \begin{cases} ERP_{20cm} (d / 20cm)^x \rightarrow d \leq 20cm \\ ERP_{20cm} \rightarrow 20cm < d \leq 40cm \end{cases}$ $x = -\log_{10} \left( \frac{60}{ERP_{20cm} \sqrt{f}} \right) \text{ and } f \text{ is in GHz}$ $\begin{cases} ERP_{20cm} : 0.3GHz \leq f < 1.5GHz \rightarrow 2040f(mW) \\ ERP_{20cm} : 1.5GHz \leq f \leq 6GHz \rightarrow 3060(mW) \end{cases}$
C	§1.1307(b)(3)(i)(C)	$\begin{cases} 0.3 \sim 1.34MHz \rightarrow ERP(W) = 1920R^2 \\ 1.34 \sim 30MHz \rightarrow ERP(W) = 3450R^2 / f^2 \\ 30 \sim 300MHz \rightarrow ERP(W) = 3.83R^2 \\ 300 \sim 1500MHz \rightarrow ERP(W) = 0.0128R^2 f \\ 1500 \sim 100000MHz \rightarrow ERP(W) = 19.2R^2 \end{cases}$ <p>f is in MHz; R is in m; <math>R &gt; \lambda / 2\pi</math></p>



## 2.3 Multiple RF Sources Exposure

Refer Std.	Exemption Exposure Thresholds (TL)
§1.1307(b)(3)(ii)(A)	The available maximum time-averaged power of each source is no more than 1 mW and there is a separation distance of two centimeters between any portion of a radiating structure operating and the nearest portion of any other radiating structure in the same device, except if the sum of multiple sources is less than 1 mW during the time-averaging period, in which case they may be treated as a single source (separation is not required)
§1.1307(b)(3)(ii)(B)	$\sum_{i=1}^a \frac{P_i}{P_{th,i}} + \sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k} \leq 1$ <p>a = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(B) of this section for P , including existing exempt transmitters and those being added.</p> <p>b = number of fixed, mobile, or portable RF sources claiming exemption using paragraph §1.1307(b)(3)(i)(C) of this section for Threshold ERP, including existing exempt transmitters and those being added.</p> <p>c = number of existing fixed, mobile, or portable RF sources with known evaluation for the specified minimum distance including existing evaluated transmitters.</p> <p>P<sub>i</sub> = the available maximum time-averaged power or the ERP, whichever is greater, for fixed, mobile, or portable RF source i at a distance between 0.5 cm and 40 cm (inclusive).</p> <p>P<sub>th,i</sub> = the exemption threshold power ( P<sub>th</sub> ) according to paragraph §1.1307(b)(3)(i)(B) of this section for fixed, mobile, or portable RF source i.</p> <p>ERP<sub>j</sub> = the ERP of fixed, mobile, or portable RF source j.</p> <p>ERP<sub>th,j</sub> = exemption threshold ERP for fixed, mobile, or portable RF source j, at a distance of at least λ/2π according to the applicable formula of paragraph §1.1307(b)(3)(i)(C) of this section.</p> <p>Evaluated<sub>k</sub> = the maximum reported SAR or MPE of fixed, mobile, or portable RF source k either in the device or at the transmitter site from an existing evaluation at the location of exposure.</p> <p>Evaluated Limit<sub>k</sub> = either the general population/uncontrolled maximum permissible exposure (MPE) or specific absorption rate (SAR) limit for each fixed, mobile, or portable RF source k, as applicable from § 1.1310 of this chapter.</p>

## 2.4 MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.  
The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \qquad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

**E** = Electric field (V/m)

**P** = RF output power (W)

**G** = EUT Antenna numeric gain (numeric)

**d** = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

## 2.5 Calculated Result and Limit

**Exposure Environment: General Population / Uncontrolled Exposure**

**WLAN 2.4G Function:**

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm2)	S Limit (mW/cm2)	Option	TL EIRP (dBm)	TL Ratio
2.4G;G1D	4.80	18.70	23.50	0.50	24.00	20.0	0.04997	1.00000	B	37.006	0.0500
2.4G;D1D	4.80	20.84	25.64	0.50	26.14	20.0	0.08180	1.00000	B	37.006	0.0819

**WLAN 5G Function:**

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm2)	S Limit (mW/cm2)	Option	TL EIRP (dBm)	TL Ratio
5.2G;D1D	5.30	25.54	30.84	0.50	31.34	20.0	0.27085	1.00000	B	37.006	0.2713
5.3G;D1D	5.30	21.15	26.45	0.50	26.95	20.0	0.09857	1.00000	B	37.006	0.0987
5.6G;D1D	5.30	21.10	26.40	0.50	26.90	20.0	0.09744	1.00000	B	37.006	0.0976
5.8G;D1D	5.30	24.69	29.99	0.50	30.49	20.0	0.22271	1.00000	B	37.006	0.2230

Note 1: Option A, B and C refer as clause 2.2

Note 2: For option B, Pth(mW) convert to TL EIRP(dBm); For option C, ERP(W) convert to TL EIRP(dBm)

Note 3: TL Ratio=Tune-up EIRP(mW)/TL EIRP(mW)

**Simultaneous Transmission Analysis Mode: WLAN 2.4GHz+WLAN 5GHz**

Mode	DG (dBi)	Power (dBm)	EIRP (dBm)	Tolerance (dB)	Tune-up EIRP (dBm)	Distance (cm)	S (mW/cm2)	S Limit (mW/cm2)	Option	TL EIRP (dBm)	TL Ratio
2.4G;D1D	4.80	20.84	25.64	0.50	26.14	20.0	0.08180	1.00000	B	37.006	0.0819
5.2G;D1D	5.30	25.54	30.84	0.50	31.34	20.0	0.27085	1.00000	B	37.006	0.2713
										Sum Ratio	0.3252
										Ratio Limit	1

Note 1: Option A, B and C refer as clause 2.2

Note 2: For option B, Pth(mW) convert to TL EIRP(dBm); For option C, ERP(W) convert to TL EIRP(dBm)

Note 3: TL Ratio=Tune-up EIRP(mW)/TL EIRP(mW)

Note 4: Refer as clause 2.3 Multiple RF Sources Exposure. Please follow below option and sum TL ration table.

Option	Sum TL Ratio_B	Option	Sum TL Ratio_C	Option	Sum TL Ratio_E
B	$\sum_{i=1}^a \frac{P_i}{P_{th,i}}$	C	$\sum_{j=1}^b \frac{ERP_j}{ERP_{th,j}}$	E	$\sum_{k=1}^c \frac{Evaluated_k}{ExposureLimit_k}$

Note: The above antenna gain was declared by manufacturer.

—————THE END—————