

FCC RF Exposure Evaluation

1. Product Information

FCC ID	2AYIJ-DC-LINK-ULR1
Product Name	5GHz Wireless Video Transmission System
Test Model	DC-LINK-ULR1
Additional Model No	DC-LINK-LR
Model Declaration	PCB board, structure and internal of these model(s) are the same, So no additional models were tested
Power Supply	Input: 100-240V~, 50/60Hz, 0.75A Output: 12V---2.0A
Modulation Type	IEEE 802.11n/ac: OFDM
Antenna Type	External Antenna
Antenna Gain	Antenna 0: Internal Antenna; 3.5dBi Antenna 1: Internal Antenna; 3.5dBi
Hardware Version	SHRX V4.0 SHTX 1.2
Software Version	1.0.0.6
Frequency Range	5190MHz-5230MHz/5755MHz-5795MHz
Channel Number	2 channels for 40MHz bandwidth(5190-5230MHz) 2 channels for 40MHz bandwidth(5755-5795MHz)
Exposure Category	General population/uncontrolled environment
EUT Type	Production Unit
Device Type	Mobile Device

2. Evaluation Method and Limit

Systems operating under the provisions of FCC 47 CFR section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

In accordance with 47 CFR FCC Part 2 Subpart J, section 2.1091 this device has been defined as mobile device whereby a distance of 0.2m normally can be maintained between the user and the device, and below RF Permissible Exposure limit shall comply with.

In accordance with KDB447498D01 for Simultaneous transmission MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on the calculated/estimated, numerically modelled or measured field strengths or power density, is ≤ 1.0 . The MPE ratio of each antenna is determined at the minimum test separation distance required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency. Either the maximum peak or spatially averaged results from measurements or numerical simulations may be used to determine the MPE ratios. Spatial averaging does not apply when MPE is estimated using simple calculations based on far-field plane-wave equivalent conditions. The antenna installation and operating requirements for the host device must meet the minimum test separation distances required by all antennas, in both standalone and simultaneous transmission operations, to satisfy compliance.

3. Refer Evaluation Method

[ANSI C95.1-1999](#): IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz.

[FCC KDB publication 447498 D01 General RF Exposure Guidance v06](#): Mobile and Portable Devices RF Exposure Procedures and Equipment Authorization Policies.

[FCC CFR 47 part1 1.1310](#): Radiofrequency radiation exposure limits.

[FCC CFR 47 part2 2.1093](#): Radiofrequency radiation exposure evaluation: portable devices

3. 2 Limit

Limits for Maximum Permissible Exposure (MPE)/Controlled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	6
3.0 – 30	1842/f	4.89/f	(900/f ²)*	6
30 – 300	61.4	0.163	1.0	6
300 – 1500	/	/	f/300	6
1500 – 100,000	/	/	5	6

Limits for Maximum Permissible Exposure (MPE)/Uncontrolled Exposure

Frequency Range(MHz)	Electric Field Strength(V/m)	Magnetic Field Strength(A/m)	Power Density (mW/cm ²)	Averaging Time (minute)
Limits for Occupational/Controlled Exposure				
0.3 – 3.0	614	1.63	(100) *	30
3.0 – 30	824/f	2.19/f	(180/f ²)*	30
30 – 300	27.5	0.073	0.2	30
300 – 1500	/	/	f/1500	30
1500 – 100,000	/	/	1.0	30

F=frequency in MHz

*=Plane-wave equivalent power density

4. MPE Calculation Method

Predication of MPE limit at a given distance

Equation from page 18 of OET Bulletin 65, Edition 97-01

$$S=PG/4\pi R^2$$

Where: S=power density

P=power input to 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

5. Antenna Information

DC-LINK-ULR1 can only use antennas certificated as follows provided by manufacturer;

Internal Identification	Antenna type and antenna number	Operate frequency band	Maximum antenna gain	Note
Antenna 0	External Antenna	5000 MHz – 6000 MHz	3.5dBi	WLAN Antenna
Antenna 1	External Antenna	5000 MHz – 6000 MHz	3.5dBi	WLAN Antenna

6. Conducted Power Results

[5.2GWIFI Max Conducted Power]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	Max Conducted Power(dBm)
			ANT 0	ANT 1
11N40 SISO	38	5190	6.56	5.77
	46	5230	6.86	6.83
11AC40 SISO	38	5190	5.71	6.16
	46	5230	6.64	6.72

[5.8WIFI Max Conducted Power]

Mode	Channel	Frequency (MHz)	Max Conducted Power(dBm)	Max Conducted Power(dBm)
			ANT 0	ANT 1
11N40 SISO	151	5755	6.40	6.09
	159	5795	6.14	6.78
11AC40 SISO	151	5755	5.71	6.16
	159	5795	6.64	6.72

7. Manufacturing Tolerance

<5.2GWLAN Ant0>

11N40 SISO (Average)		
Channel	Channel 38	Channel 46
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0
11AC40 SISO (Average)		
Channel	Channel 38	Channel 46
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0

<5.2GWLAN Ant1>

11N40 SISO (Average)		
Channel	Channel 38	Channel 46
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0
11AC40 SISO (Average)		
Channel	Channel 38	Channel 46
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0

<5.8GWLAN Ant0>

11N40 SISO (Average)		
Channel	Channel 151	Channel 159
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0
11AC40 SISO (Average)		
Channel	Channel 151	Channel 159
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0

<5.8GWLAN Ant1>

11N40 SISO (Average)		
Channel	Channel 151	Channel 159
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0
11AC40 SISO (Average)		
Channel	Channel 151	Channel 159
Target (dBm)	6.0	6.0
Tolerance \pm (dB)	1.0	1.0

8. Evaluation Results**8.1 Standalone MPE**

As declared by the Applicant, the EUT is a wireless device used in a fix application, at least 20 cm from any body part of the user or nearby persons; from the maximum EUT RF output power, the minimum separation distance, $r=20\text{cm}$, as well as the gain of the used antenna refer to antenna information, the RF power density can be obtained.

5.2G Ant0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
11N40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000
11AC40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000

5.2G Ant1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm^2)	MPE Limits (mW/cm^2)
	dBm	mW					
11N40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000
11AC40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000

5.8G Ant0

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
11N40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000
11AC40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000

5.8G Ant1

Modulation Type	Output power		Antenna Gain (dBi)	Antenna Gain (linear)	Duty Cycle	MPE (mW/cm ²)	MPE Limits (mW/cm ²)
	dBm	mW					
11N40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000
11AC40 SISO	7.0	5.0119	3.5	2.2387	100%	0.0022	1.0000

Remark:

1. Output power including tune-up tolerance;
2. MPE evaluate distance is 20cm from user manual provide by manufacturer;

8.2 Simultaneous Transmission MPE

Modulation Type	MPE _{Antenna0} (mW/cm ²)	MPE _{Antenna1} (mW/cm ²)	ΣMPE ratios	Limit	Results
IEEE 802.11n HT40	0.0022	0.0022	0.0044	1.0	PASS
IEEE 802.1111AC40 SISO	0.0022	0.0022	0.0044	1.0	PASS

9. Conclusion

The measurement results comply with the FCC Limit per 47 CFR 2.1091 for the uncontrolled RF Exposure of mobile device.

.....THE END OF REPORT.....