1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant: Hangzhou LinknLink Technology Co.,Ltd.

Address of applicant: Room 2502, Building A, 57 Jiang'er Road, Binjiang, Hangzhou, 310052,

P.R.China

Manufacturer: Hangzhou LinknLink Technology Co.,Ltd.

Address of manufacturer: Room 2502, Building A, 57 Jiang'er Road, Binjiang, Hangzhou, 310052,

P.R.China

General Description of EUT:

Product Name: WiFi Module

Trade Name: /

Model No.: LL8720-P

Adding Model(s):

Rated Voltage: DC3.3V

Power Adapter Model: /

FCC ID: 2A9BE-LL8720-P Equipment Type: Mobile device

Technical Characteristics of EUT:

Support Standards: 802.11b, 802.11g, 802.11n

Frequency Range: 2412-2462MHz for 802.11b/g/n(HT20)

RF Output Power: 16.98dBm (Conducted)

Type of Modulation: CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM

Quantity of Channels: 11 for 802.11b/g/n(HT20)

Channel Separation: 5MHz

Type of Antenna: PCB Antenna

Antenna Gain: 0.34dBi

1.2 RF Exposure Exemption

According to §1.1307(b)(3) and KDB 447498 D04 Interim General RF Exposure Guidance v01, system operating under the provisions of this section shall be operating in a manner that the public is not exposed to radio frequency energy level in excess limit for maximum permissible exposure.

Option A: FCC Rule Part 1.1307 (b)(3)(i)(A):The available maximum time-averaged power is no more than 1mW, regardless of separation distance.

Option B: FCC Rule Part 1.1307 (b)(3)(i)(B): The available maximum time-averaged power or effective radiated power (ERP), whichever is greater, is less than or equal to the threshold P_{th} (mW) described in the following formula. P_{th} is given by:

$$P_{th} \text{ (mW)} = \begin{cases} ERP_{20 cm} (d/20 \text{ cm})^x & d \le 20 \text{ cm} \\ ERP_{20 cm} & 20 \text{ cm} < d \le 40 \text{ cm} \end{cases}$$

Where

$$x = -\log_{10}\left(\frac{60}{ERP_{20\ cm}\sqrt{f}}\right) \text{ and } f \text{ is in GHz};$$

and

$$ERP_{20\;cm}\;(\text{mW}) = \begin{cases} 2040f & 0.3\;\text{GHz} \le f < 1.5\;\text{GHz} \\ \\ 3060 & 1.5\;\text{GHz} \le f \le 6\;\text{GHz} \end{cases}$$

d = the separation distance (cm);

Option C: FCC Rule Part 1.1307 (b)(3)(i)(C): The minimum separation distance (R in meters) from the body of a nearby person for the frequency (f in MHz) at which the source operates, the ERP (watts) is no more than the calculated value prescribed for that frequency. R must be at least $\lambda/2\pi$, where λ is the free-space operating wavelength in meters.

Single RF Sources Subject to Routine Environmental Evaluation				
RF Source frequency (MHz)	Threshold ERP (watts)			
0.3-1.34	1,920 R ²			
1.34-30	3,450 R ² /f ²			
30-300	3.83 R ²			
300-1,500	0.0128 R ² f			
1,500-100,000	19.2R ²			

For Multiple RF sources: FCC Rule Part 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).
- (B) In the case of fixed RF sources operating in the same time-averaging period, or of multiple mobile or portable RF sources within a device operating in the same time averaging period, if the sum of the fractional contributions to the applicable thresholds is less than or equal to 1 as indicated in the following equation.

$$\sum_{i=1}^{a} \frac{P_i}{P_{th,i}} + \sum_{j=1}^{b} \frac{ERP_j}{ERP_{th,j}} + \sum_{k=1}^{c} \frac{Evaluated_k}{Exposure\ Limit_k} \le 1$$

1.3 Calculated Result

Radio	Prediction	Output	Antenna	Duty	Tune-Up	ERP	
Access	Frequency	Power	Gain	Cycle	Time-Averaged Power		
Technology	(MHz)	(dBm)	(dBi)	(%)	(dBm)	(dBm)	
Wi-Fi	2412	16.98	0.34	100	17.00	15.19	

Frequency	Option	Min. Distance	Max.	Power	Exposure Limit	Ratio	Result
(MHz)	Option	(cm)	(dBm)	(mW)	(mW)	Kalio	Pass/Fail
2412	С	20.00	15.19	33.04	768.00	0.04	Pass

Note: 1. Time-Averaged Power=Output Power * Duty Cycle; ERP= Time-Averaged Power+ Antenna gain-2.15dB

- 2. Option A, B and C refers as clause 1.2.
- 3. For option B, Max (time-averaged power, effective radiated power (ERP)) converts to Max. Power. For option C, ERP converts to Max. Power;
- 4. For option B, P_{th} (mW) converts to Exposure Limit (mW); For option C, ERP (W) converts to Exposure Limit (mW).
 - 5. Ratio= Tune-Up ERP (mW)/ Exposure Limit (mW)

Mode for Simultaneous Multi-band Transmission:

Radio Access	Ratio 1	Ratio 2	Simultaneous	Limit	Result
Technology	Katio i		Ratio	LIIIIIL	Pass/Fail

Result: Pass