1. RF Exposure Requirements

1.1 General Information

Client Information

Applicant:	CE LINK LIMITED
Address of applicant:	22 Dongkang Road, Dalingshan Town, Dongguan City, Guangdong Province, China.
Manufacturer:	DONGGUAN CE LINK LIMITED
Address of manufacturer:	22 Dongkang Road, Dalingshan Town, Dongguan City, Guangdong Province, China.
Factory#1:	ANFU CE LINK LIMITED
Address of factory	Anfu County Industrial Zone, Ji'an city, Jiangxi Province, P.R. China.
Factory#2:	CE LINK VIET NAM COMPANY LIMITED.
Address of factory	Part of lots CNSG-04, CNSG-06 Van Trung Industrial Zone, Van Trung Ward, Viet Yen Town, Bac Giang Province, Vietnam

General Description of EUT:

Product Name:	Homebase KIT
Trade Name:	CE-LINK
Model No.:	W2000
Adding Model(s):	K100, K101, K102, K120, K121, W2000-xx (xx indicates color, e.g. WH indicates Withe)
Rated Input:	DC Power Jack: DC 12V
Rated Output:	Each USB-A 2.0 Port: DC 5V
Rated Current:	DC Power Jack: 2.0A Each USB-A 2.0 Port: 0.5A
Power Adapter:	Model: K25E120200U Input:100-240V~ 50/60Hz 0.6A Output: 12.0V⎓2.0A
FCC ID:	A4X-W2000
Equipment Type:	Mobile device

Technical Characteristics of EUT:

Wi-Fi 2.4G (RTL8192)

Support Standards:	802.11b, 802.11g, 802.11n
Frequency Range:	2412-2462MHz for 802.11b/g/n(HT20) 2422-2452MHz for 802.11n(HT40)
RF Output Power:	ANT1_IPEX1: 16.88dBm (Conducted) ANT2_IPEX2: 17.62dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM

Quantity of Channels:	11 for 802.11b/g/n(HT20); 7 for 802.11n(HT40)
Channel Separation:	5MHz
Type of Antenna:	FPC Antenna
Antenna Gain:	ANT1_IPEX1: 1.58dBi ANT2_IPEX2: 1.49dBi
Wi-Fi 2.4G (M6355XU1)	
Support Standards:	802.11b, 802.11g, 802.11n, 802.11ax
Frequency Range:	2412-2462MHz for 802.11b/g/n/ax(HT/HE_SU20) 2422-2452MHz for 802.11n/ax(HT/HE_SU40)
RF Output Power:	15.64dBm (Conducted)
Type of Modulation:	CCK, OFDM, QPSK, BPSK, 16QAM, 64QAM
Quantity of Channels:	11 for 802.11b/g/n/ax(HT/HE SU20); 7 for 802.11n/ax(HT/HE SU40)
Channel Separation:	5MHz
Type of Antenna:	FPC Antenna
Antenna Gain:	ANT_IPEX3: 1.49dBi

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 λ/2π, 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^2f
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 Access Technology	Prediction Frequency (MHz)	Output Power (dBm)	Antenna Gain (dBi)	Duty Cycle (%)	Tune-Up Time-Averaged Power (dBm)	ERP (dBm)
Wi-Fi 2.4G (RTL8192) ANT 1	2412	16.88	1.58	100	17.00	16.43
Wi-Fi 2.4G (RTL8192) ANT 2	2412	17.62	1.49	100	18.00	17.34
Wi-Fi 2.4G (M6355XU1)	2412	15.64	1.49	100	16.00	15.34

Frequency (MHz)	Option	Min. Distance (cm)	Max. Power (dBm)	Max. Power (mW)	Exposure Limit (mW)	Ratio	Result Pass/Fail
2412	C	20.00	16.43	43.95	768.00	0.06	Pass
2412	C	20.00	17.34	54.20	768.00	0.07	Pass
2412	C	20.00	15.34	34.20	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 Technology	Ratio 1	Ratio 2	Ratio 3	Simultaneous Ratio	Limit	Result Pass/Fail
RTL8192 ANT 1 + RTL8192 ANT 2 + M6355XU1	0.06	0.07	0.04	0.17	1	Pass

Result: Pass