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FCC Maximum Permissible Exposure(MPE) Estimation Report

Product Name: LTE CPE

Model: B525s-65a

Report No.: SYBH(Z-SAR)01612017-2

FCC ID: QISB525S-65A

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REV.	DESCRIPTION	ISSUED DATE	REMARK
Rev.1.0	Initial Test Report Release	2017-02-09	Liu Tao

Table of Contents

1	EUT Description	7
1.1	General Description	8
2	Test specification(s)	9
3	Testing laboratory	9
4	Applicant and Manufacturer	9
5	Application details	9
6	Ambient Condition.....	9
7	RF Exposure Requirements.....	10
7.1	FCC MPE Limits	11
8	RF Exposure Evaluation	12
8.1	Operation in GSM850.....	12
8.2	Operation in GSM1900.....	13
8.3	Operation in UMTS Band II	14
8.4	Operation in UMTS Band V	14
8.5	Operation in LTE Band II	15
8.6	Operation in LTE Band IV.....	15
8.7	Operation in LTE Band V	16
8.8	Operation in LTE Band VII	16
8.9	Operation in LTE Band XXVI.....	17
8.10	Operation in LTE Band XXXVIII	17
8.11	Operation in LTE Band XLI	18
8.12	Operation in WLAN 2.4G.....	18
8.13	Operation in WLAN 5G.....	19
9	Exposure calculations for multiple sources(FCC)	20
9.1	Estimation for WLAN2.4G MIMO.....	21
9.2	Estimation for GSM850& WLAN2.4G	21
9.3	Estimation for GSM1900& WLAN2.4G	21

9.4	Estimation for UMTS Band II & WLAN2.4G.....	21
9.5	Estimation for UMTS Band V & WLAN2.4G	22
9.6	Estimation for LTE Band II & WLAN2.4G	22
9.7	Estimation for LTE Band IV & WLAN2.4G.....	22
9.8	Estimation for LTE Band V & WLAN2.4G	22
9.9	Estimation for LTE Band VII & WLAN2.4G.....	23
9.10	Estimation for LTE Band XXVI & WLAN2.4G	23
9.11	Estimation for LTE Band XXXVIII & WLAN2.4G.....	23
9.12	Estimation for LTE Band XLI & WLAN2.4G.....	23
9.13	Estimation for WLAN5G MIMO.....	24
9.14	Estimation for GSM850& WLAN5G	24
9.15	Estimation for GSM1900& WLAN5G	24
9.16	Estimation for UMTS Band II & WLAN5G.....	25
9.17	Estimation for UMTS Band V & WLAN5G	25
9.18	Estimation for LTE Band II & WLAN5G	25
9.19	Estimation for LTE Band IV & WLAN5G.....	26
9.20	Estimation for LTE Band V & WLAN5G	26
9.21	Estimation for LTE Band VII & WLAN5G.....	26
9.22	Estimation for LTE Band XXVI & WLAN5G.....	27
9.23	Estimation for LTE Band XXXVIII & WLAN5G.....	27
9.24	Estimation for LTE Band XLI & WLAN5G	27
9.25	Estimation for WLAN 2.4G & WLAN 5G.....	28
9.26	Estimation for GSM850 & WLAN 2.4G & WLAN 5G	28
9.27	Estimation for GSM1900 & WLAN 2.4G & WLAN 5G	28
9.28	Estimation for UMTS Band II & WLAN 2.4G & WLAN 5G.....	29
9.29	Estimation for UMTS Band V & WLAN 2.4G & WLAN 5G.....	29
9.30	Estimation for LTE Band II & WLAN 2.4G & WLAN 5G.....	30
9.31	Estimation for LTE Band IV & WLAN 2.4G & WLAN 5G	30
9.32	Estimation for LTE Band V & WLAN 2.4G & WLAN 5G	31

9.33	Estimation for LTE Band VII & WLAN 2.4G & WLAN 5G.....	31
9.34	Estimation for LTE Band XXVI & WLAN 2.4G & WLAN 5G	32
9.35	Estimation for LTE Band XXXVIII & WLAN 2.4G & WLAN 5G.....	32
9.36	Estimation for LTE Band XLI & WLAN 2.4G & WLAN 5G.....	33

1 EUT Description

Device Information:				
Product Name :		LTE CPE		
Model :		B525s-65a		
FCC ID:		QISB525S-65A		
Device Type :		Mobile Device		
Device Phase:		Identical Prototype		
Exposure Category:		Uncontrolled environment/general population		
Hardware Version :		WL1B525I		
Software Version :		11.232.08.DM.00		
Antenna Type :		Internal Antenna/External Antenna		
Device Operating Configurations:				
Supporting Mode(s)		GSM850/1900,UMTS Band II / V, LTE band II/IV/V/VII/XXVI/XXXVIII/XLI ,WiFi 2.4G/5G		
Test Modulation		GSM(GMSK/8PSK),UMTS(QPSK),LTE(QPSK/16QAM), WiFi(DSSS/OFDM)		
Operating Range(s)	Frequency	Band	Tx (MHz)	Rx (MHz)
		GSM850	824-849	869-894
		GSM1900	1850-1910	1930-1990
		UMTS Band II	1850-1910	1930-1990
		UMTS Band V	824-849	869-894
		LTE Band II	1850-1910	1930-1990
		LTE Band IV	1710-1755	2110-2155
		LTE Band V	824-849	869-894
		LTE Band VII	2500-2570	2620-2690
		LTE Band XXVI	814-849	859-894
		LTE Band XXXVIII	2570-2620	2570-2620
		LTE Band XLI	2500-2690	2500-2690
		WiFi 2.4G	2432-2462	2432-2462
		WiFi 5G	5150-5250	5150-5250

Note: The device only supports downlink LTE CA. The maximum tune-up power and antenna gain with downlink carrier aggregation active is the same as LTE Release 8 when downlink carrier aggregation is inactive, so additional MPE Evaluation is not required for downlink LTE CA.

1.1 General Description

B525s-65a LTE/DC-HSPA+/WCDMA/EDGE/GPRS/GSM mutli-mode LTE CPE is subscriber equipment in the LTE/UMTS/GSM system and support WLAN 802.11a/b/g/n/ac. B525s-65a implement such functions as RF signal receiving/transmitting, LTE/DC-HSPA+/WCDMA and EDGE/GPRS/GSM protocol processing, data service etc. It provides USIM card interface, RJ45/RJ11 Ethernet interface, USB port and external antenna interfaces.

2 Test specification(s)

ANSI Std C95.1-1992	Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz – 300 GHz.(IEEE Std C95.1-1991)
KDB 447498 D01	General RF Exposure Guidance v06

3 Testing laboratory

Test Site	The Reliability Laboratory of Huawei Technologies Co., Ltd.
Test Location	Section G1,Huawei Base Bantian, Longgang District, Shenzhen 518129, P.R. China
Telephone	+86 755 28780808
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State of accreditation	The Test laboratory (area of testing) is accredited according to ISO/IEC 17025. CNAS Registration number: L0310 A2LA TESTING CERT #2174.01 & 2174.02 & 2174.03

4 Applicant and Manufacturer

Company Name	HUAWEI TECHNOLOGIES CO., LTD
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

5 Application details

Start Date of test	2017-02-09
End Date of test	2017-02-09

6 Ambient Condition

Ambient temperature	20°C – 24°C
Relative Humidity	30% – 70%

7 RF Exposure Requirements

An estimation of MPE in this application for product is used to ensure if it complies to the rules of the standard in the regulation list above.

Maximum permissible exposure (MPE) refers to the RF energy that is acceptable for human exposure. It is broken down into two categories, Occupational/controlled and General population/uncontrolled.

Occupational/controlled limits apply in situations in which persons are exposed as a consequence of their employment provided those persons are fully aware of the potential for exposure and can exercise control over their exposure. Limits for occupational/controlled exposure also apply in situations when an individual is transient through a location where occupational/controlled limits apply provided he or she is made aware of the potential for exposure.

General population/uncontrolled exposures apply in situations in which the general public may be exposed, or in which persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or can not exercise control over their exposure.

A rough estimation of the expected exposure in power flux density on a given point can be made with the following equation:

$$S = \frac{P \times G}{4 \times \pi \times R^2}$$

Where:

S = power density

P = power input to the antenna

G = numeric gain of the antenna in the direction of interest relative to an isotropic radiator

R= distance to the centre of radiation of the antenna

EIRP = P*G

The antenna of the product, under normal use condition is at least 20 cm away from the

body of the user. Warning statement to the user for keeping at least 20cm separation distance and the prohibition of operating to a person has been printed on the user's manual. Therefore, the S of the device is calculated with R=20cm, and if it is below the limit S, then we can conclude the device complies with the rules.

7.1 FCC MPE Limits

We analysis if it comply with the limits for General population/uncontrolled exposure. The FCC MPE limits for field strength and power density are given in 47CFR 1.1310(Table below).These limits are generally based on recommended exposure guidelines published by the National Council on Radiation Protection and Measurements (NCRP), and also partly based on guidelines recommended by the American National Standards Institute (ANSI) in Section 4.1 of ANSI/IEEE C95.1.

Table: Limits For Maximum Permissible Exposure (MPE)

(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 ²)	Averaging Time (minute) E ² , H ² or S
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
(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 ²)	Averaging Time (minute) E ² , H ² or S
0.3-1.34	614	1.63	(100)*	30
1.34-30	824/f	2.19/f	(180/f)*	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	

8 RF Exposure Evaluation

8.1 Operation in GSM850

(uplink: 824-849MHz, downlink: 869-894MHz)

Antenna	Mode	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	GSM CS	35.00	1.50	36.5	558.35	20	0.111	0.549	PASS
	1TS*(1/8)	35.00	1.50	36.5	558.35	20	0.111	0.549	PASS
	2TS*(2/8)	35.00	1.50	36.5	1116.71	20	0.222	0.549	PASS
	3TS*(3/8)	33.20	1.50	34.7	1106.70	20	0.220	0.549	PASS
	4TS*(4/8)	32.00	1.50	33.5	1119.36	20	0.223	0.549	PASS
Internal Antenna 2	GSM CS	35.00	1.50	36.5	558.35	20	0.111	0.549	PASS
	1TS*(1/8)	35.00	1.50	36.5	558.35	20	0.111	0.549	PASS
	2TS*(2/8)	35.00	1.50	36.5	1116.71	20	0.222	0.549	PASS
	3TS*(3/8)	33.20	1.50	34.7	1106.70	20	0.220	0.549	PASS
	4TS*(4/8)	32.00	1.50	33.5	1119.36	20	0.223	0.549	PASS
External Antenna 1	GSM CS	35.00	1.00	36.0	497.63	20	0.099	0.549	PASS
	1TS*(1/8)	35.00	1.00	36.0	497.63	20	0.099	0.549	PASS
	2TS*(2/8)	35.00	1.00	36.0	995.27	20	0.198	0.549	PASS
	3TS*(3/8)	33.20	1.00	34.2	986.35	20	0.196	0.549	PASS
	4TS*(4/8)	32.00	1.00	33.0	997.63	20	0.199	0.549	PASS
External Antenna 2	GSM CS	35.00	3.00	38.0	788.70	20	0.157	0.549	PASS
	1TS*(1/8)	35.00	3.00	38.0	788.70	20	0.157	0.549	PASS
	2TS*(2/8)	35.00	3.00	38.0	1577.39	20	0.314	0.549	PASS
	3TS*(3/8)	33.20	3.00	36.2	1563.26	20	0.311	0.549	PASS
	4TS*(4/8)	32.00	3.00	35.0	1581.14	20	0.315	0.549	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.315mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.2 Operation in GSM1900

(uplink: 1850-1910MHz, downlink: 1930-1990MHz)

Antenna	Mode	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	GSM CS	32.00	2.00	34.0	313.99	20	0.062	1.000	PASS
	1TS*(1/8)	32.00	2.00	34.0	313.99	20	0.062	1.000	PASS
	2TS*(2/8)	32.00	2.00	34.0	627.97	20	0.125	1.000	PASS
	3TS*(3/8)	30.20	2.00	32.2	622.35	20	0.124	1.000	PASS
	4TS*(4/8)	29.00	2.00	31.0	629.46	20	0.125	1.000	PASS
Internal Antenna 2	GSM CS	32.00	2.00	34.0	313.99	20	0.062	1.000	PASS
	1TS*(1/8)	32.00	2.00	34.0	313.99	20	0.062	1.000	PASS
	2TS*(2/8)	32.00	2.00	34.0	627.97	20	0.125	1.000	PASS
	3TS*(3/8)	30.20	2.00	32.2	622.35	20	0.124	1.000	PASS
	4TS*(4/8)	29.00	2.00	31.0	629.46	20	0.125	1.000	PASS
External Antenna 1	GSM CS	32.00	1.00	33.0	249.41	20	0.050	1.000	PASS
	1TS*(1/8)	32.00	1.00	33.0	249.41	20	0.050	1.000	PASS
	2TS*(2/8)	32.00	1.00	33.0	498.82	20	0.099	1.000	PASS
	3TS*(3/8)	30.20	1.00	31.2	494.35	20	0.098	1.000	PASS
	4TS*(4/8)	29.00	1.00	30.0	500.00	20	0.100	1.000	PASS
External Antenna 2	GSM CS	32.00	3.00	35.0	395.28	20	0.079	1.000	PASS
	1TS*(1/8)	32.00	3.00	35.0	395.28	20	0.079	1.000	PASS
	2TS*(2/8)	32.00	3.00	35.0	790.57	20	0.157	1.000	PASS
	3TS*(3/8)	30.20	3.00	33.2	783.49	20	0.156	1.000	PASS
	4TS*(4/8)	29.00	3.00	32.0	792.45	20	0.158	1.000	PASS

Note: *- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.158 mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.3 Operation in UMTS Band II

(uplink: 1850-1910MHz, downlink: 1930-1990MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	1.50	27.2	524.8	20	0.104	1.000	PASS
Internal Antenna 2	25.70	1.50	27.2	524.8	20	0.104	1.000	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	1.000	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148 mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.4 Operation in UMTS Band V

(uplink: 824-849MHz, downlink: 869-894MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	1.50	27.2	524.8	20	0.104	0.549	PASS
Internal Antenna 2	25.70	1.50	27.2	524.8	20	0.104	0.549	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	0.549	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	0.549	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.5 Operation in LTE Band II

(uplink: 1850-1910MHz, downlink: 1930-1990MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	1.50	27.2	524.8	20	0.104	1.000	PASS
Internal Antenna 2	25.70	1.50	27.2	524.8	20	0.104	1.000	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	1.000	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148 mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.6 Operation in LTE Band IV

(uplink: 1710-1755MHz, downlink: 2110-2155MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	1.50	27.2	524.8	20	0.104	1.000	PASS
Internal Antenna 2	25.70	1.50	27.2	524.8	20	0.104	1.000	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	1.000	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.7 Operation in LTE Band V

(uplink: 824-849MHz, downlink: 869-894MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	1.50	27.2	524.8	20	0.104	0.549	PASS
Internal Antenna 2	25.70	1.50	27.2	524.8	20	0.104	0.549	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	0.549	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	0.549	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.8 Operation in LTE Band VII

(uplink: 2500-2570MHz, downlink: 2620-2690MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	2.00	27.7	588.8	20	0.117	1.000	PASS
Internal Antenna 2	25.70	2.00	27.7	588.8	20	0.117	1.000	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	1.000	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.9 Operation in LTE Band XXVI

(uplink: 814-849MHz, downlink: 859-894MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	1.50	27.2	524.8	20	0.104	0.543	PASS
Internal Antenna 2	25.70	1.50	27.2	524.8	20	0.104	0.543	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	0.543	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	0.543	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.10 Operation in LTE Band XXXVIII

(uplink: 2570-2620MHz, downlink: 2570-2620MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	2.00	27.7	588.8	20	0.117	1.000	PASS
Internal Antenna 2	25.70	2.00	27.7	588.8	20	0.117	1.000	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	1.000	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.11 Operation in LTE Band XLI

(uplink: 2500-2690MHz, downlink: 2500-2690MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Internal Antenna 1	25.70	2.00	27.7	588.8	20	0.117	1.000	PASS
Internal Antenna 2	25.70	2.00	27.7	588.8	20	0.117	1.000	PASS
External Antenna 1	25.70	1.00	26.7	467.7	20	0.093	1.000	PASS
External Antenna 2	25.70	3.00	28.7	741.3	20	0.148	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.148mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.12 Operation in WLAN 2.4G

(uplink: 2432-2462MHz, downlink: 2432-2462MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Antenna 1	19.00	1.00	20.0	100.0	20	0.020	1.000	PASS
Antenna 2	19.00	1.00	20.0	100.0	20	0.020	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.020 mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

8.13 Operation in WLAN 5G

(uplink: 5150-5250MHz, downlink: 5150-5250MHz)

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Conclusion
Antenna 1	18.00	1.00	19.0	79.4	20	0.016	1.000	PASS
Antenna 2	18.00	1.00	19.0	79.4	20	0.016	1.000	PASS
Antenna 3	18.00	1.00	19.0	79.4	20	0.016	1.000	PASS

Note:*- based on the maximum tune-up tolerance limit declared by manufacturer

According to the Table, we can conclude the max power density level at 20 cm is 0.016 mW/cm², which is below the uncontrolled exposure limit, so we can conclude it is into compliance.

9 Exposure calculations for multiple sources(FCC)

When a number of sources at different frequencies, and/or broadband sources, contribute to the total exposure, it becomes necessary to weigh each contribution relative to the MPE in accordance with the provisions of Table(A) and Table(B). To comply with the MPE, the fraction of the MPE in terms of E^2 , H^2 (or power density) incurred within each frequency interval should be determined and the sum of all such fractions should not exceed unity.

In order to ensure compliance with the MPE for a controlled environment, the sum of the ratios of the power density to the corresponding MPE should not exceed unity. That is

$$\sum_{i=1}^n \frac{S_i}{MPE_i} \leq 1$$

The product also has multiple transmitters The Simultaneous Transmission Possibilities are as below:

NO.	Simultaneous Tx Combination
1	WLAN 2.4G MIMO(2*2)
2	GSM/UMTS/LTE +WLAN 2.4G SISO/ MIMO(2*2)
3	WLAN 5G MIMO(2*2 or 3*3)
4	GSM/UMTS/LTE +WLAN 5G SISO/ MIMO(2*2 or 3*3)
5	WLAN 2.4G SISO/MIMO + WLAN 5G (Ant 3)
6	GSM/UMTS/LTE +WLAN 2.4G SISO (Antenna 1 or 2) + WLAN 5G(Antenna 2 or 1) + WLAN 5G(Antenna 3)
7	GSM/UMTS/LTE + WLAN 2.4G MIMO + WLAN 5G (Ant 3)

Note:

- 1) The device has four GSM/UMTS/LTE antennas: Internal Antenna 1, Internal Antenna 2, External Antenna1 and External Antenna 2. They can not transmit simultaneously.
- 2) The device has three WLAN antennas: WLAN Antenna 1 Antenna 2 and Antenna 3:
 - a) The WLAN Antenna 1 and Antenna 2 can support WLAN 2.4G and WLAN 5G.
 - b) The WLAN Antenna 3 only supports WLAN 5G.
 - c) The WLAN 2.4G can support 2*2 MIMO.
 - d) The WLAN 5G can support 2*2 MIMO or 3*3 MIMO.
 - f) For each WLAN Antenna (Antenna 1 or Antenna 2), it can be used for WLAN 2.4G or WLAN 5G, but WLAN 2.4G and WLAN 5G can not transmit simultaneously.

9.1 Estimation for WLAN2.4G MIMO

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
Antenna 1	16.00	1.00	17.0	50.1	20	0.010	1.000	0.020	PASS
Antenna 2	16.00	1.00	17.0	50.1	20	0.010	1.000		

Note: *- based on the maximum tune-up tolerance limit declared by manufacturer

9.2 Estimation for GSM850& WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	GSM850	0.315	0.549	0.594	PASS
	WLAN 2.4G SISO	0.020	1.000		
2	GSM850	0.315	0.549	0.594	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.3 Estimation for GSM1900& WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	GSM1900	0.158	1.000	0.178	PASS
	WLAN SISO	0.020	1.000		
2	GSM1900	0.158	1.000	0.178	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.4 Estimation for UMTS Band II & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	UMTS Band II	0.148	1.000	0.168	PASS
	WLAN SISO	0.020	1.000		
2	UMTS Band II	0.148	1.000	0.168	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.5 Estimation for UMTS Band V & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	UMTS Band V	0.148	0.549	0.290	PASS
	WLAN SISO	0.020	1.000		
2	UMTS Band V	0.148	0.549	0.290	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.6 Estimation for LTE Band II & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band II	0.148	1.000	0.168	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band II	0.148	1.000	0.168	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.7 Estimation for LTE Band IV & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band IV	0.148	1.000	0.168	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band IV	0.148	1.000	0.168	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.8 Estimation for LTE Band V & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band V	0.148	0.549	0.290	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band V	0.148	0.549	0.290	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.9 Estimation for LTE Band VII & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band VII	0.148	1.000	0.168	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band VII	0.148	1.000	0.168	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.10 Estimation for LTE Band XXVI & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XXVI	0.148	0.543	0.293	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band XXVI	0.148	0.543	0.293	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.11 Estimation for LTE Band XXXVIII & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XXXVIII	0.148	1.000	0.168	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band XXXVIII	0.148	1.000	0.168	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.12 Estimation for LTE Band XLI & WLAN2.4G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XLI	0.148	1.000	0.168	PASS
	WLAN SISO	0.020	1.000		
2	LTE Band XLI	0.148	1.000	0.168	PASS
	WLAN MIMO with Antenna 1	0.010	1.000		
	WLAN MIMO with Antenna 2	0.010	1.000		

9.13 Estimation for WLAN5G MIMO

Antenna	Tune-up limit (dBm)	Gain (dBi)	EIRP* (dBm)	EIRP (mW)	R(cm)	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
Antenna 1	18.00	1.00	19.0	79.4	20	0.016	1.000	0.048	PASS
Antenna 2	18.00	1.00	19.0	79.4	20	0.016	1.000		
Antenna 3	18.00	1.00	19.0	79.4	20	0.016	1.000		

Note: *- based on the maximum tune-up tolerance limit declared by manufacturer

9.14 Estimation for GSM850& WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	GSM850	0.315	0.549	0.590	PASS
	WLAN 5G SISO	0.016	1.000		
2	GSM850	0.315	0.549	0.606	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	GSM850	0.315	0.549	0.622	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.15 Estimation for GSM1900& WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	GSM1900	0.158	1.000	0.174	PASS
	WLAN 5G SISO	0.016	1.000		
2	GSM1900	0.158	1.000	0.190	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	GSM1900	0.158	1.000	0.206	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.16 Estimation for UMTS Band II & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	UMTS Band II	0.148	1.000	0.164	PASS
	WLAN 5G SISO	0.016	1.000		
2	UMTS Band II	0.148	1.000	0.180	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	UMTS Band II	0.148	1.000	0.196	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.17 Estimation for UMTS Band V & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	UMTS Band V	0.148	0.549	0.286	PASS
	WLAN 5G SISO	0.016	1.000		
2	UMTS Band V	0.148	0.549	0.302	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	UMTS Band V	0.148	0.549	0.318	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.18 Estimation for LTE Band II & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band II	0.148	1.000	0.164	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band II	0.148	1.000	0.180	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band II	0.148	1.000	0.196	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.19 Estimation for LTE Band IV & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band IV	0.148	1.000	0.164	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band IV	0.148	1.000	0.180	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band IV	0.148	1.000	0.196	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.20 Estimation for LTE Band V & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band V	0.148	0.549	0.286	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band V	0.148	0.549	0.302	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band V	0.148	0.549	0.318	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.21 Estimation for LTE Band VII & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band VII	0.148	1.000	0.164	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band VII	0.148	1.000	0.180	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band VII	0.148	1.000	0.196	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.22 Estimation for LTE Band XXVI & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XXVI	0.148	0.543	0.289	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band XXVI	0.148	0.543	0.305	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band V XXVI	0.148	0.543	0.321	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.23 Estimation for LTE Band XXXVIII & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XXXVIII	0.148	1.000	0.164	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band XXXVIII	0.148	1.000	0.180	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band XXXVIII	0.148	1.000	0.196	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.24 Estimation for LTE Band XLI & WLAN5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XLI	0.148	1.000	0.164	PASS
	WLAN 5G SISO	0.016	1.000		
2	LTE Band XLI	0.148	1.000	0.180	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
2	LTE Band XLI	0.148	1.000	0.196	PASS
	WLAN 5G MIMO with Antenna 1	0.016	1.000		
	WLAN 5G MIMO with Antenna 2	0.016	1.000		
	WLAN 5G MIMO with Antenna 3	0.016	1.000		

9.25 Estimation for WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	WLAN 2.4G SISO	0.020	1.000	0.036	PASS
	WLAN 5G SISO	0.016	1.000		
2	WLAN 2.4G MIMO with Ant 1	0.010	1.000	0.036	PASS
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000	0.052	PASS
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.26 Estimation for GSM850 & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	GSM850	0.315	0.549	0.610	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	GSM850	0.315	0.549	0.610	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	GSM850	0.315	0.549	0.626	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.27 Estimation for GSM1900 & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	GSM1900	0.158	1.000	0.194	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	GSM1900	0.158	1.000	0.194	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	GSM1900	0.158	1.000	0.210	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.28 Estimation for UMTS Band II & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	UMTS Band II	0.148	1.000	0.184	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	UMTS Band II	0.148	1.000	0.184	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Antenna 3)	0.016	1.000		
3	UMTS Band II	0.148	1.000	0.200	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.29 Estimation for UMTS Band V & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	UMTS Band V	0.148	0.549	0.306	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	UMTS Band V	0.148	0.549	0.306	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	UMTS Band V	0.148	0.549	0.322	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.30 Estimation for LTE Band II & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band II	0.148	1.000	0.184	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band II	0.148	1.000	0.184	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band II	0.148	1.000	0.200	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.31 Estimation for LTE Band IV & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band IV	0.148	1.000	0.184	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band IV	0.148	1.000	0.184	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band IV	0.148	1.000	0.200	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.32 Estimation for LTE Band V & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band V	0.148	0.549	0.306	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band V	0.148	0.549	0.306	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band V	0.148	0.549	0.322	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.33 Estimation for LTE Band VII & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band VII	0.148	1.000	0.184	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band VII	0.148	1.000	0.184	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band VII	0.148	1.000	0.200	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.34 Estimation for LTE Band XXVI & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XXVI	0.148	0.543	0.309	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band XXVI	0.148	0.543	0.309	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band XXVI	0.148	0.543	0.325	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.35 Estimation for LTE Band XXXVIII & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XXXVIII	0.148	1.000	0.184	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band XXXVIII	0.148	1.000	0.184	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band XXXVIII	0.148	1.000	0.200	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

9.36 Estimation for LTE Band XLI & WLAN 2.4G & WLAN 5G

No.	Mode	S (mW/cm ²)	MPE Limit (mW/cm ²)	Calculation result	Conclusion
1	LTE Band XLI	0.148	1.000	0.184	PASS
	WLAN 2.4G SISO	0.020	1.000		
	WLAN 5G SISO	0.016	1.000		
2	LTE Band XLI	0.148	1.000	0.184	PASS
	WLAN 2.4G MIMO with Ant 1	0.010	1.000		
	WLAN 2.4G MIMO with Ant 2	0.010	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		
3	LTE Band XLI	0.148	1.000	0.200	PASS
	WLAN 2.4G SISO (Ant 1 or 2)	0.020	1.000		
	WLAN 5G (Ant 2 or 1)	0.016	1.000		
	WLAN 5G (Ant 3)	0.016	1.000		

According to the Table above, we can conclude that the calculation results of all simultaneous transmission possibilities are less than 1, so it is into compliance.

Therefore the product also meets the requirements under multiple sources condition.

END