



WiFi module: WP-WIFI6-A, WP-WIFI6-B

Supports

2.4 GHz / 5 GHz 802.11 a/ac/ax/b/g/n Wi-Fi radio

In

Host systems: IR1821-K9, IR1831-K9, IR1833-K9, IR1835-K9

FCC ID: LDKWPWIFI6

IC: 2461N-WPWIFI6

Against the following Specifications:

FCC CFR47 Rule Parts 1.1307, 1.1310 & 2.1091

ISED RSS-102 Issue 5



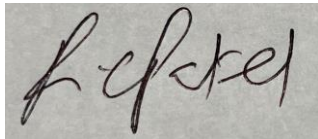

ACCREDITED

CERTIFICATE #1178.01

Cisco Systems

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This report replaces any previously entered test report under EDCS – **21780260**. This test report has been electronically authorized and archived using the CISCO Engineering Document Control system. Test Report Template EDCS# 11644121

Attestation Statement of Compliance

The WP-WIFI6-A and WP-WIFI6-B in IR1800 series router has been evaluated for Maximum Permissible Exposure in compliance with 47 Code of Federal Regulations [Part 1.1307(b) (for fixed devices), Part 2.1091 (for mobile devices)]. Part 1.1307(b) refers to limits in Part 1.1310 and 2.1091. The evaluation was in accordance with methodology as referenced in KDB 447498 D01 General RF Exposure Guidance v06.

This study addresses the addition of an additional pair of transmitters using the data derived in the afore mentioned report EDCS #

- FCC/ISED Single Band 2.4GHz Report – 21711219, 21711221, 21711223
- FCC/ISED Dual Band 2.4GHz Report – 21711226, 21711229, 217112131
- FCC 5150-5250MHz Conducted test report – 21711232, 21712185
- FCC 5250-5350MHz Conducted test report – 21712186, 21712187
- FCC 5470-5725MHz Conducted test report – 21712188, 21712189
- FCC 5725MHz-5850MHz Conducted test report - 21712190, 21712191

- ISED 5250-5350MHz Conducted test report – 21712196, 21712197
- ISED 5470-5725MHz Conducted test report – 21712198, 21712199
- ISED 5725MHz-5850MHz Conducted test report - 21712201, 21712202

This study also addresses the co-located transmitter. The following cellular modems was considered during simultaneous operation

- P-LTEA-EA - 16585055,16585056 ,16585057, 16585058
- P-LTE-VZ – 13328078, 13328077
- P-LTE-US – 13327600, 13327597, 13327598, 13327599
- P-LTE-MNA - 21581304, 21581305, 21581306
- P-LTEAP18-GL – 21775209, 21775210, 21775211, 21775212, 21775213, 21775214,



EDCS – 21780260

The limits used for this evaluation are in line with the recommendations of the World Health Organizations (WHO) International Committee on Non-Ionizing Radiation Protection (ICNIRP) as well as the American National Standards Institute (ANSI) C95.1.

The limits chosen are of **General Population/Uncontrolled Exposure**.

The following case scenarios were used:

- LTE
- Wi-Fi

This device must be installed to provide a separation distance of at least 20 cm from all persons. Installers must be provided with antenna installation and transmitter operating conditions for satisfying RF exposure compliance. Based on the study this case scenario, the General Population/Uncontrolled Exposure and the minimum recommended distance is around 20cm (8 inches) from the antenna.

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EUT Description

WP-WIFI6 is Wifi 802.11ax Wi-Fi 6 access point module for industrial IoT routing and gateway platforms which is a field replaceable Wifi interface module designed for IR1800 series platform. It includes a 2x2 MIMO 802.11ax 2.4 GHz radio and a 2x2 MIMO 802.11ax 5 GHz radio

IR1835-K9 is the next generation of IR829, based on IOS XE, with advanced features such as modular WiFi, modular Cellular/WAN, CAN Bus, Dead Reckoning etc.

The product has the following interfaces:

4 GE LAN Ports

1 GE WAN / 1 Fiber Port (Alternate to GE Copper port)

1 RS-232 Serial

1 RS232/RS485

1 Type-A USB for Storage

1 GPS Slot

1 WIFI Slot

1 mSATA Slot

2 Cellular PIM Slots [Main Aux and GPS (Only on Sierra Wireless Modules)]

Alarm Port

Micro-USB

DC Power input (DC Min/Max 9-32)

The radio supports the following modes of operation. The modes are further defined in the radio Theory of Operation. The modes included in this report represent the worst-case data for all modes. Data is recorded at the lowest supported data rate for each mode. This report covers operation on channel 1-11.

Supported Antennas

The following antennas are supported by this product series.

The data included in this report represent the worst-case data for all antennas.

Cellular Antennas

Antenna P/N	Gain (dBi)	Gain (dBi)	Gain (dBi)	Connector	Antenna Description
	698-960MHz	1710-2690MHz	3400-3800MHz	type	
ANT-4G-OMNI-OUT-N	1.5	3.5	5.5	N-Type (Female)	Cisco outdoor omnidirectional antenna for 2G, 3G, and 4G LTE cellular
Antenna P/N	Gain (dBi)	Gain (dBi)	Gain (dBi)	Connector	Antenna Description
	617-960MHz	1450-4200MHz	4400-7125MHz	type	
ANT-5G-OMNI-OUT-N	2.5	4	4.3	N-Type (Female)	Cisco outdoor omnidirectional antenna for 2G, 3G, 4G LTE, 5G NR FR1 cellular
Antenna P/N	Gain (dBi)	Gain (dBi)	Gain (dBi)	Connector	Antenna Description
	698-960MHz	1448-1511MHz	for 1710-2700MHz	type	
ANT-2-4G2-O	3.8	4.3	5.5	TNC male	Cisco Cellular 2-in-1 Vehicle Mount and Fixed Infrastructure Antenna
Antenna P/N	Gain (dBi)	Gain (dBi)		Connector	Antenna Description
	698-960MHz	for 1710-2700MHz		type	
4G-LTE-ANTM-O-3-B	2.5	2.5		SMA-male	Cisco cellular 3-in-1- indoor and outdoor antenna
Antenna P/N	Gain (dBi)	Gain (dBi)	Gain (dBi)	Connector	Antenna Description
	698-960MHz	1448-1511MHz	1710-2700MHz	type	
ANT-3-4G2G1-O	3.8	4.3	5.5	TNC male	Cisco Cellular 2-in-1 Vehicle Mount and Fixed Infrastructure Antenna
Antenna P/N	Gain (dBi)	Gain (dBi)	Gain (dBi)	Connector	Antenna Description
	698-960MHz	for 1448-1511MHz	for 1710-2700MHz	type	
ANT-5-4G2WL2G1-O	2.9	4.8	6.5	TNC male	Cisco 5-in-1 Vehicle Mount and Fixed Infrastructure Antenna
Antenna P/N	Gain (dBi)	Gain (dBi)		Connector	Antenna Description
	617 -960 MHz	1710-5925MHz		type	
ANT-7-5G4WL2G1-O	2.1	7.4		SMA-male	4x 5G (LTE) / 2x WiFi / 1x GNSS
Antenna P/N	Gain (dBi)	Gain (dBi)	Gain (dBi)	Connector	Antenna Description
	617-960MHz	1400-2960MHz	2500-2690MHz 3400-3900MHz	type	
LTE-ANTM2-SMA-D	0	2	5	SMA connector	Cisco LTE-ANTM2-SMA-D omnidirectional dipole antenna, SMA connector, and articulating join



Antenna P/N	Gain (dBi) 617-960MHz	Gain (dBi) 1710-5925MHz	Connector type	Antenna Description
5G-ANTM-SMA-D	3.1	4.5	SMA connector	Cisco LTE-ANTM2-SMA-D omnidirectional dipole antenna, SMA connector, and articulating join

- 3.8dBi represents worst case antenna gain in the 617-960MHz frequency range
- 7.4dBi represents worst case antenna gain in the 1710-5925MHz frequency range
- 4.8dBi represents worst case antenna gain in the 1448-1511 frequency range

Wifi Antennas

Frequency	Part Number	Antenna Type	Peak Antenna Gain (dBi)	>30 degree 5 GHz Antenna Gain (dBi)
2.4/5 GHz	W-ANTM2050D-RPSMA=	Omnidirectional swivel stick dipole	2 / 4	0
	W-ANTM2-O-2-RPSMA	Omnidirectional	4 / 4	0
	ANT-7-5G4WL2G1-O=	7-in-1 vehicle mount omnidirectional	8 / 8	3
	5G-ANTM-O-4-B=	9-in-1 vehicle mount omnidirectional	8 / 8	3

- 8dBi represents worst antenna gain

1.0 Methodology

All calculations were made in accordance with ANSI C95.1,

Measurement Uncertainty Values

Parameter	Max MU from standard	Declared MU
Occupied Channel Bandwidth	+/- 5%	+/-2%
RF Output Power, conducted	+/- 1,5dB	+/-1.4dB
Power Spectral Density, conducted	+/- 3dB	+/- 2dB
Unwanted emissions, conducted	+/- 3dB	+/- 2dB
All emissions, radiated	+/- 6dB	+/- 3.2dB
Temperature	+/- 3C	+/- 0.7C
Supply Voltages	+/- 3%	+/- 2.5%
Time	+/- 5%	+/-2%

2.0 Technical Requirements

2.1 Single Band Operation – Limits

FCC 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 (minutes)
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 (minutes)
0.3-1.34	614	1.63	(100) *	30
1.34-30	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

NOTE 1: See Section 1 for discussion of exposure categories.

NOTE 2: The averaging time for General Population/Uncontrolled exposure to fixed transmitters is not applicable for mobile and portable transmitters. See 47 CFR §§2.1091 and 2.1093 on source-based time-averaging requirements for mobile and portable transmitters.

3.0 Calculations

Given

$$E = \sqrt{(30 * P * G) / d} \quad \text{and} \quad S = E^2 / 3770$$

were

E=Field Strength in Volts/meter

P=Power in Watts

G=Numeric Antenna Gain

d=Distance in meters

S=Power Density in mW/cm²

Combine equations and rearrange the terms to express the distance as a function of the remaining variables:

$$d = \sqrt{((30 * P * G) / (3770 * S))}$$

Changing to units of power in mW and distance in cm, using:

$$P(\text{mW}) = P(\text{W}) / 1000 \quad d(\text{cm}) = 100 * d(\text{m})$$

yields

$$d = 100 * \sqrt{((30 * (P / 1000) * G) / (3770 * S))}$$

$$d = 0.282 * \sqrt{(P * G / S)}$$

where

d=Distance in cm

P=Power in mW

G=Numeric Antenna Gain

S=Power Density in mW/cm²

Substituting the logarithmic form of power and gain using:

$$P(\text{mW}) = 10^{(P(\text{dBm}) / 10)} \quad G(\text{numeric}) = 10^{(G(\text{dBi}) / 10)}$$

yields

$$d = 0.282 * 10^{((P+G)/20)} / \sqrt{S} \quad \text{Equation (1)}$$

and

$$s = ((0.282 * 10^{((P+G)/20)} / d)^2) \quad \text{Equation (2)}$$

where

d=MPE distance in cm

P=Power in dBm

G=Antenna Gain in dBi

S=Power Density in mW/cm²

4.0 Results

4.1 FCC RF Exposure Exemption criteria:

FCC 2.1019 - (c)(1) Evaluation of compliance with the exposure limits in §1.1310, and preparation of an EA if the limits are exceeded, is necessary for mobile devices with single RF sources having either more than an available maximum time-averaged power of 1 mW or more than the ERP listed in Table 1 to §1.1307(b)(3)(i)(C), whichever is greater. For mobile devices do not exempt by §1.1307(b)(3)(i)(C) at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz, evaluation of compliance with the exposure limits in §1.1310 of this chapter is necessary if the ERP of the device is greater than ERP_{20cm} in the formula below. If the ERP of a single RF source at distances from 20 centimeters to 40 centimeters and frequencies from 0.3 GHz to 6 GHz is not easily obtained, then the available maximum time-averaged power may be used (*i.e.*, without consideration of ERP) in comparison with the following formula only if the physical dimensions of the radiating structure(s) do not exceed the electrical length of $\lambda/4$ or if the antenna gain is less than that of a half-wave dipole (1.64 linear value).

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

All unlicensed personal communications service (PCS) devices and unlicensed NII devices shall be subject to the limits for general population/uncontrolled exposure.

4.2 ISED RF Exposure requirements

The ISED MPE limits from RSS-102 Issue 5 are shown in the table below.

**RF Field Strength Limits for Devices Used by the General Public
(Uncontrolled Environment)**

Frequency Range (MHz)	Electric Field (V/m rms)	Magnetic Field (A/m rms)	Power Density (W/m ²)	Reference Period (minutes)
0.003-10 ²¹	83	90	-	Instantaneous*
0.1-10	-	0.73/ <i>f</i>	-	6**
1.1-10	87/ <i>f</i> ^{0.5}	-	-	6**
10-20	27.46	0.0728	2	6
20-48	58.07/ <i>f</i> ^{0.25}	0.1540/ <i>f</i> ^{0.25}	8.944/ <i>f</i> ^{0.5}	6
48-300	22.06	0.05852	1.291	6
300-6000	3.142 <i>f</i> ^{0.3417}	0.008335 <i>f</i>	0.02619 <i>f</i> ^{0.6834}	6
6000-15000	61.4	0.163	10	6
15000-150000	61.4	0.163	10	616000/ <i>f</i> ^{1.2}
150000-300000	0.158 <i>f</i> ^{0.5}	4.21 x 10 ⁻⁴ <i>f</i> ^{0.5}	6.67 x 10 ⁻⁵ <i>f</i>	616000/ <i>f</i> ^{1.2}

Note: *f* is frequency in MHz.
 *Based on nerve stimulation (NS).
 **Based on specific absorption rate (SAR).

4.3 ISED RF Exposure exemption requirements

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 22.48/ *f*^{0.5} W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1.31 x 10⁻² *f*^{0.6834} W (adjusted for tune-up tolerance), where *f* is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

5.0 Maximum Device EIRP and ERP

The declared maximum output powers including tune-up tolerances are used in conjunction with the maximum antenna gains to find the maximum EIRP and ERP values

Maximum EIRP and ERP of all Radios						
Radio types		Band (GHz)	Max Power (dBm)	Max Antenna Gain (dBi)	Max total EIRP (dBm)	Max total ERP (dBm)
WLAN - 2.4GHz	2400-2483.5	Single band 2.4	22.5	8	30.5	28.35
WLAN - 2.4GHz	2400-2483.5	Dual band 2.4	22.1	8	30.1	27.95
WLAN - 5GHz	5150-5250	5.2	18	8	26	23.85
	5250-5350	5.3	23	8	31	28.85
	5470-5725	5.6	22	8	30	27.85
	5725-5850	5.8	22.6	8	30.6	28.45
P-LTEA-EA	617-960MHz	617	24	3.8	27.8	25.65
	1710-5925MHz	1710	24	7.4	31.4	29.25
	1448-1511	1575.42	24	4.8	28.8	26.65
P-LTE-VZ	LTE Band 4 1710-1755	LTE Band 4 1710-1755	24	7.4	31.4	29.25
	LTE Band 13 777-787	LTE Band 13 777-787	24	3.8	27.8	25.65
P-LTE-US	LTE/WCDMA Band 2 1850-1910	LTE/WCDMA Band 2 1850-1910	24	7.4	31.4	29.25
	LTE/WCDMA Band 4 1710-1755	LTE/WCDMA Band 4 1710-1755	24	7.4	31.4	29.25

	LTE/WCDMA Band 5 824-849	LTE/WCDMA Band 5 824-849	24	3.8	27.8	25.65
	LTE/WCDMA Band 12 699-716	LTE/WCDMA Band 12 699-716	24	3.8	27.8	25.65
P-LTE-MNA	LTE/WCDMA Band 2 1850-1910	LTE/WCDMA Band 2 1850-1910	24	7.4	31.4	29.25
	LTE/WCDMA Band 4 1710-1755	LTE/WCDMA Band 4 1710-1755	24	7.4	31.4	29.25
	LTE/WCDMA Band 5 824-849	LTE/WCDMA Band 5 824-849	24	3.8	27.8	25.65
	LTE Band 12 699-716	LTE Band 12 699-716	24	3.8	27.8	25.65
	LTE Band 13 699MHz	LTE Band 13 699MHz	24	3.8	27.8	25.65
	LTE Band 14 788MHz	LTE Band 14 788MHz	24	3.8	27.8	25.65
	LTE Band 17 704	LTE Band 17 704	24	3.8	27.8	25.65
	LTE Band 66 1710MHz	LTE Band 66 1710MHz	24	7.4	31.4	29.25
P-LTEAP18-GL	617-960MHz	617	24	3.8	27.8	25.65
	1710-5925MHz	1710	24	7.4	31.4	29.25
	1448-1511	1575.42	24	4.8	28.8	26.65

- Band 30 will only be applicable for non-vehicular environment

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6.0 Evaluation against exemption criteria for RF Exposure Evolution

Evaluation of Device Radios Against FCC and ISED Exemption Criteria								
Radio types	Frequency Band	Band (MHz)	Max Total ERP (mW)	FCC Exemption ERP Limits (mW)	FCC Exempt? (Yes/No)	Max total EIRP (mW)	ISED Exemption EIRP Limits (mW)	ISED Exempt? (Yes/No)
WLAN	Single band 2400-2483.5	2437	683.9116473	NA	Yes	1122.018454	2703.0144	Yes
WLAN	Dual band 2400-2483.5	2437	623.7348355	NA	Yes	1023.292992	2703.0144	Yes
WLAN	5150-5250	5240	242.6610095	3060	Yes	398.1071706	4561.0234	Yes
	5250-5350	5280	767.3614894	3060	Yes	1258.925412	4584.7886	Yes
	5470-5725	5610	609.5368972	3060	Yes	1000	4778.7302	Yes
	5725-5850	5785	699.841996	3060	Yes	1148.153621	4880.1078	Yes
P-LTEA-EA	LTE/WCDMA Band 2	1855	841.3951416	3060	Yes	1379.888032	2243.1459	Yes
	LTE/WCDMA Band 4	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes
	LTE/WCDMA Band 5	824	367.2823005	1680.96	Yes	602.3429728	1288.2969	Yes
	LTE Band 7	2500	841.3951416	3060	Yes	1379.888032	2750.575	Yes
	LTE Band 12	699	367.2823005	1425.96	Yes	602.3429728	1151.296	Yes
	LTE Band 13	777	367.2823005	1585.08	Yes	602.3429728	1237.6134	Yes
	LTE Band 25	1850	841.3951416	3060	Yes	1379.888032	2239.0122	Yes
	LTE Band 26	814	367.2823005	1660.56	Yes	602.3429728	1277.5915	Yes
	LTE Band 30	2305	841.3951416	3060	Yes	1379.888032	2602.0798	Yes

	LTE Band 41	2496	841.3951416	3060	Yes	1379.888032	2747.5667	Yes
P-LTE-VZ	LTE Band 4 1710-1755	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes
	LTE Band 13 777-787	777	367.2823005	1585.08	Yes	602.3429728	1237.6134	Yes
P-LTE-US	LTE/WCDMA Band 2 1850-1910	1850	841.3951416	3060	Yes	1379.888032	2239.0122	Yes
	LTE/WCDMA Band 4 1710-1755	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes
	LTE/WCDMA Band 5 824-849	824	367.2823005	1680.96	Yes	602.3429728	1288.2969	Yes
	LTE/WCDMA Band 12 699-716	699	367.2823005	1425.96	Yes	602.3429728	1151.296	Yes
P-LTE-MNA	LTE/WCDMA Band 2 1850-1910	1850	841.3951416	3060	Yes	1379.888032	2239.0122	Yes
	LTE/WCDMA Band 4 1710-1755	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes
	LTE/WCDMA Band 5 824-849	824	367.2823005	1680.96	Yes	602.3429728	1288.2969	Yes
	LTE Band 12 699-716	699	367.2823005	1425.96	Yes	602.3429728	1151.296	Yes
	LTE Band 13 699MHz	699	367.2823005	1425.96	Yes	602.3429728	1151.296	Yes
	LTE Band 14 788MHz	788	367.2823005	1607.52	Yes	602.3429728	1249.5606	Yes
	LTE Band 17 704	704	367.2823005	1436.16	Yes	602.3429728	1156.9177	Yes
	LTE Band 66 1710MHz	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes

P-LTEAP18-GL	LTE/WCDMA Band 2 1850-1910	1850	841.3951416	3060	Yes	1379.888032	2239.0122	Yes
	LTE/WCDMA Band 4 1710-1755	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes
	LTE/WCDMA Band 5 824-849	824	367.2823005	1680.96	Yes	602.3429728	1288.2969	Yes
	LTE Band 7 2500-2570	2500	841.3951416	3060	Yes	1379.888032	2750.575	Yes
	LTE Band 12 699-716	699	367.2823005	1425.96	Yes	602.3429728	1151.296	Yes
	LTE Band 13 699MHz	699	367.2823005	1425.96	Yes	602.3429728	1151.296	Yes
	LTE Band 14 788MHz	788	367.2823005	1607.52	Yes	602.3429728	1249.5606	Yes
	LTE Band 17 704	704	367.2823005	1436.16	Yes	602.3429728	1156.9177	Yes
	LTE Band 18	817.5	367.2823005	1666.68	Yes	602.3429728	1281.3431	Yes
	LTE Band 19	832.5	367.2823005	1697.28	Yes	602.3429728	1297.3641	Yes
	LTE Band 25 1850-1915	1850	841.3951416	3060	Yes	1379.888032	2239.0122	Yes
	LTE Band 26 814-849	814	367.2823005	1660.56	Yes	602.3429728	1277.5915	Yes
	LTE Band 30 2305-2315	2305	841.3951416	3060	Yes	1379.888032	2602.0798	Yes
	LTE Band 38	2575.5	841.3951416	3060	Yes	1379.888032	2807.0754	Yes
	LTE Band 41 2496-2690	2496	841.3951416	3060	Yes	1379.888032	2747.5667	Yes
	LTE Band 66 1710MHz	1710	841.3951416	3060	Yes	1379.888032	2121.7824	Yes
LTE Band	673	367.2823005	1372.92	Yes	602.3429728	1121.8552	Yes	

6.0 MPE Calculations and Evaluation

Power densities are calculated for all radios, and sum totals are compared to the FCC and ICC limits to support the 20cm minimum device-user separation

Power density is calculated as:

$$S = \frac{EIRP}{4\pi R^2}$$

- For FCC evaluation, the WLAN band with the highest EIRP is chosen for the worst-case. Device can only transmit in either Single band 2.4GHz or Dual mode 2.4GHz at a time with 5GHz Wifi
- ISED Limits for 300MHz-6GHz are calculated as (from table in section 4.2)
- For ISED in accordance with RSS-102 section 3.2, the fractions of the applicable limits are summed

MPE Power Evaluation at 20 cm												
Radio types	Frequency Bands	Channel (MHz)	Max total EIRP (dBm)	Max total EIRP (mW)	$S = \frac{EIRP}{4\pi r^2}$ (mW/cm ²)	FCC Limit (mW/cm ²)	FCC Result	S (W/m ²)	ISED Limit (W/m ²)	S/Limit	ISED Results	MPE Distance (cm)
WLAN	Single band 2400-2483.5	2437	30.5	1122.0	0.2	1.0	Pass	2.2	5.4	0.4	Pass	14.03
WLAN	Dual band 2400-2483.5	2437	30.1	1023.3	0.2	1.0	Pass	2.0	5.4	0.4	Pass	12.79
WLAN	5150-5250	5240	26.0	398.1	0.1	1.0	Pass	0.8	9.1	0.1	Pass	4.98
	5250-5350	5280	31.0	1258.9	0.3	1.0	Pass	2.5	9.2	0.3	Pass	15.74
	5470-5725	5610	30.0	1000.0	0.2	1.0	Pass	2.0	9.6	0.2	Pass	12.50
	5725-5850	5785	30.6	1148.2	0.2	1.0	Pass	2.3	9.8	0.2	Pass	14.35

P-LTEA-EA	LTE/WCDMA Band 2 1850-1910	1855	31.4	1379.9	0.3	1.0	Pass	2.7	4.5	0.6	Pass	17.25
	LTE/WCDMA Band 4 1710-1755	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25
	LTE/WCDMA Band 5 824-849	824	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 7 2500-2570	2500	31.4	1379.9	0.3	1.0	Pass	2.7	5.5	0.5	Pass	17.25
	LTE Band 12 699-716	699	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
	LTE Band 13 777-787	777	27.8	602.3	0.1	0.5	Pass	1.2	2.5	0.5	Pass	7.53
	LTE Band 25 1850-1915	1850	31.4	1379.9	0.3	1.0	Pass	2.7	4.5	0.6	Pass	17.25
	LTE Band 26 814-849	814	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 30 2305-2315	2305	31.4	1379.9	0.3	1.0	Pass	2.7	5.2	0.5	Pass	17.25
	LTE Band 41 2496-2690	2496	31.4	1379.9	0.3	1.0	Pass	2.7	5.5	0.5	Pass	17.25
P-LTE-VZ	LTE Band 4 1710-1755	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25
	LTE Band 13 777-787	777	27.8	602.3	0.1	0.5	Pass	1.2	2.5	0.5	Pass	7.53

P-LTE-US	LTE/WCDMA Band 2 1850-1910	1850	31.4	1379.9	0.3	1.0	Pass	2.7	4.5	0.6	Pass	17.25
	LTE/WCDMA Band 4 1710-1755	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25
	LTE/WCDMA Band 5 824-849	824	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE/WCDMA Band 12 699-716	699	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
P-LTE-MNA	LTE/WCDMA Band 2 1850-1910	1850	31.4	1379.9	0.3	1.0	Pass	2.7	4.5	0.6	Pass	17.25
	LTE/WCDMA Band 4 1710-1755	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25
	LTE/WCDMA Band 5 824-849	824	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 12 699-716	699	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
	LTE Band 13 699MHz	699	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
	LTE Band 14 788MHz	788	27.8	602.3	0.1	0.5	Pass	1.2	2.5	0.5	Pass	7.53
	LTE Band 17 704	704	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
	LTE Band 66 1710MHz	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25

P- LTEAP18- GL	LTE/WCDMA Band 2 1850-1910	1850	31.4	1379.9	0.3	1.0	Pass	2.7	4.5	0.6	Pass	17.25
	LTE/WCDMA Band 4 1710-1755	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25
	LTE/WCDMA Band 5 824-849	824	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 7 2500-2570	2500	31.4	1379.9	0.3	1.0	Pass	2.7	5.5	0.5	Pass	17.25
	LTE Band 12 699-716	699	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
	LTE Band 14 788MHz	788	27.8	602.3	0.1	0.5	Pass	1.2	2.5	0.5	Pass	7.53
	LTE Band 17 704	704	27.8	602.3	0.1	0.5	Pass	1.2	2.3	0.5	Pass	7.53
	LTE Band 18	817.5	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 19	832.5	27.8	602.3	0.1	0.6	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 25 1850-1915	1850	31.4	1379.9	0.3	1.0	Pass	2.7	4.5	0.6	Pass	17.25
	LTE Band 26 814-849	814	27.8	602.3	0.1	0.5	Pass	1.2	2.6	0.5	Pass	7.53
	LTE Band 30 2305-2315	2305	31.4	1379.9	0.3	1.0	Pass	2.7	5.2	0.5	Pass	17.25
	LTE Band 38	2575.5	31.4	1379.9	0.3	1.0	Pass	2.7	5.6	0.5	Pass	17.25
	LTE Band 41 2496-2690	2496	31.4	1379.9	0.3	1.0	Pass	2.7	5.5	0.5	Pass	17.25
	LTE Band 66 1710MHz	1710	31.4	1379.9	0.3	1.0	Pass	2.7	4.2	0.6	Pass	17.25
LTE Band 77 673	673	27.8	602.3	0.1	0.4	Pass	1.2	2.2	0.5	Pass	7.53	
Total				5140.7	1.0	1.0	Pass					

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