FCC §2.1091, LP0002-2018 §5.20.2, ISED RSS-102 RF EXPOSURE REPORT

For

Cisco Systems, Inc.

125 W Tasman Drive
San Jose, CA 95134, USA

FCC ID: LDKROFSN2177
IC: 2461N-ROFSN2177

C1920AXP-X, C1920AXP-EWC-X
(X=A, B, and T)
2400-2483.5 MHz, 5150-5250 MHz
5250-5350 MHz, 5470-5725 MHz, 5725-5850 MHz

Product Type:	Cisco Catalyst 9120AX Series
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CERTIFICATE #3297.02

1 FCC §2.1091, §15.247(i) & ISEDC RSS-102 & LP0002– RF Exposure

1.1 Applicable Standards

According to FCC §15.407(f), §1.1307(b)(1) and LP0002 5.20.2.2, systems operating under the provisions of this 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.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for General Population/Uncontrolled Exposure				
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

According to ISED RSS-102 Issue 5:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

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[6] 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 $4.49/f^{0.5}$ 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 $1.31 \times 10^{-2} f^{0.6834}$ 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).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

1.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from 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

1.3 MPE Results for FCC

2.4 GHz Wi-Fi Aux

Maximum output power at antenna input terminal (dBm):	13.4
Maximum output power at antenna input terminal (mW):	21.88
Prediction distance (cm):	30
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	13
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.04
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.039 mW/cm^2. Limit is 1.0 mW/cm^2.

2.4 GHz Wi-Fi

Maximum output power at antenna input terminal (dBm):	21.8
Maximum output power at antenna input terminal (mW):	151.36
Prediction distance (cm):	30
Prediction frequency (MHz):	2437
Maximum Antenna Gain, typical (dBi):	13
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.3
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.267 mW/cm^2. Limit is 1.0 mW/cm^2.

2.4 GHz BLE

Maximum peak output power at antenna input terminal (dBm):	2.88
Maximum peak output power at antenna input terminal (mW):	1.94
Prediction distance (cm):	30
Prediction frequency (MHz):	2426
Maximum Antenna Gain, typical (dBi):	13
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.003
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.003 mW/cm^2. Limit is 1.0 mW/cm^2.

5 GHz Wi-Fi Aux

Maximum peak output power at antenna input terminal (dBm):	13.9
Maximum peak output power at antenna input terminal (mW):	24.55
Prediction distance (cm):	30
Prediction frequency (MHz):	5825
Maximum Antenna Gain, typical (dBi):	13
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.04
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.043 mW/cm^2. Limit is 1.0 mW/cm^2.

5 GHz Wi-Fi XOR

Maximum peak output power at antenna input terminal (dBm):	22.7
Maximum peak output power at antenna input terminal (mW):	186.21
Prediction distance (cm):	30
Prediction frequency (MHz):	5785
Maximum Antenna Gain, typical (dBi):	13
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.3
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.329 mW/cm^2. Limit is 1.0 mW/cm^2.

5 GHz Wi-Fi Regular

Maximum peak output power at antenna input terminal (dBm):	22.9
Maximum peak output power at antenna input terminal (mW):	194.98
Prediction distance (cm):	30
Prediction frequency (MHz):	5745
Maximum Antenna Gain, typical (dBi):	13
Maximum Antenna Gain (numeric):	19.95
Power density of prediction frequency at 30.0 cm (mW/cm^2):	0.3
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1

The device is compliant with the requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 30 cm is 0.344 mW/cm^2. Limit is 1.0 mW/cm^2.

RF Exposure evaluation has been evaluated for all radio co-location to represent the worst case.

Frequency Band	Max Conducted Power(dBm)	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
Worst Case							
5 GHz Wi-Fi Regular	22.9	30	0.3	1.0	30%	98.3 %	100%
5 GHz Wi-Fi Aux	13.9	30	0.04	1.0	4%		
5 GHz Wi-Fi XOR	22.7	30	0.3	1.0	30%		
2.4 GHz Wi-Fi	21.8	30	0.3	1.0	30%		
2.4 GHz Aux	13.4	30	0.04	1.0	4%		
2.4 GHz BLE	2.88	30	0.003	1.0	0.3%		

1.4 RF exposure evaluation exemption for ISEDC

2.4 GHz Wi-Fi

21.8 + 13 dBi = 34.8 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.903 W = 36.904 dBm

2.4 GHz Wi-Fi Aux

13.4 + 6 dBi = 19.4 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.903 W = 36.904 dBm

BLE

2.88 + 6 dBi = 8.88 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.903 W = 36.904 dBm

5 GHz Wi-Fi Aux

13.9 + 6 dBi = 19.9 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.903 W = 36.904 dBm

5 GHz Wi-Fi XOR

22.7 + 12 dBi = 34.7 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.880 W = 36.884 dBm

5 GHz Wi-Fi Regular

22.9 + 13 dBi = 35.9 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.880 W = 36.884 dBm

Therefore the RF exposure is not required.