



SPORTON International Inc.

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Project No: CB10501331

Maximum Permissible Exposure Report

Applicant's company	Xirrus, Inc.
Applicant Address	2101 Corporate Center Drive, Thousand Oaks, CA 91320 USA
FCC ID	SK6-XD2240B
Manufacturer's company	Life-On Network Communication (Dongguan) Limited
Manufacturer Address	30#Keji Rd., Yin Hu Industrial Area, Qingxi Town, DongGuan City, Guangdong, China

Product Name	Wireless Access Point
Brand Name	XIRRUS, AVAYA
Model No.	XD2240 -1, WAP9144 -1
Ref. Standard(s)	47 CFR FCC Part 2 Subpart J, section 2.1091
Received Date	Aug. 17, 2015
Final Test Date	Apr. 25, 2016
Submission Type	Class II Change



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SPORTON INTERNATIONAL INC.



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History of This Test Report

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA582537-02	Rev. 01	Initial issue of report	Feb. 03, 2016
FA582537-02	Rev. 02	1. Modifying product information (Model No. and FCC ID). 2. Adding the Bluetooth radio information. 3. Evaluating Bluetooth Maximum Permissible Exposure.	May 18, 2016

1. GENERAL DESCRIPTION

1.1. EUT General Information

RF General Information			
Evaluation Mode	Frequency Range (MHz)	Operating Frequency (MHz)	Modulation Type
2.4GHz WLAN	2400-2483.5	2412-2462	802.11b: DSSS (DBPSK, DQPSK, CCK) 802.11g/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
5GHz WLAN	5150-5250 5250-5350 5470-5725 5725-5850	5180-5240 5260-5320 5500-5720 5745-5825	802.11a/n: OFDM (BPSK, QPSK, 16QAM, 64QAM) 802.11ac: OFDM (BPSK, QPSK, 16QAM, 64QAM, 256QAM)
Bluetooth	2400-2483.5	2402-2480	BR / EDR: FHSS (GFSK / $\pi/4$ -DQPSK / 8DPSK) LE: DSSS (GFSK)

1.2. Table for Multiple List

The brand name and model numbers in the following table are all refer to the identical product.

Brand Name	Model Name	Description
XIRRUS	XD2240 -1	All the design is the same, just for different marketing use.
AVAYA	WAP9144 -1	

From the above models, model: XD2240 -1 was selected as representative model for the test and its data was recorded in this report.

1.3. Table for Class II Change

This product is an extension of original one reported under Sporton project number: FA582537-03

Below is the table for the change of the product with respect to the original one.

Modifications	Performance Checking
Adding 5 GHz Band 2 and Band 3 (5250~5350 MHz, 5470~5725 MHz)	Maximum Permissible Exposure

Note: Maximum Permissible Exposure of 2.4GHz and 5GHz Band1/Band 4 is based on original report.

1.4. Testing Location

Testing Location		
☐	HWA YA	ADD : No. 52, Hwa Ya 1st Rd., Kwei-Shan Hsiang, Tao Yuan Hsien, Taiwan, R.O.C. TEL : 886-3-327-3456 FAX : 886-3-327-0973
☒	JHUBEI	ADD : No.8, Lane 724, Bo-ai St., Jhubei City, HsinChu County 302, Taiwan, R.O.C. TEL : 886-3-656-9065 FAX : 886-3-656-9085

2. MAXIMUM PERMISSIBLE EXPOSURE

2.1. Limit of Maximum Permissible Exposure

(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 E ² , H ² or S (minutes)
0.3-3.0	614	1.63	(100)*	6
3.0-30	1842 / f	4.89 / f	(900 / f)*	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 E ² , H ² or S (minutes)
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

Note: f = frequency in MHz ; *Plane-wave equivalent power density

2.2. MPE Calculation Method

The MPE was calculated at 20 cm to show compliance with the power density limit.

The following formula was used to calculate the Power Density:

$$E \text{ (V/m)} = \frac{\sqrt{30 \times P \times G}}{d} \quad \text{Power Density: } Pd \text{ (W/m}^2\text{)} = \frac{E^2}{377}$$

E = Electric field (V/m)

P = Peak RF output power (W)

G = EUT Antenna numeric gain (numeric)

d = Separation distance between radiator and human body (m)

The formula can be changed to

$$Pd = \frac{30 \times P \times G}{377 \times d^2}$$

2.3. Calculated Result and Limit

Exposure Environment: General Population / Uncontrolled Exposure

For 5GHz Band(Band 1 + Band 4):

Antenna Type : PIFA Ant.

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT40): 23.22dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain (dBi)	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
20	5795	7.29	5.3580	23.2245	210.1109	0.2240	1	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$

For 5GHz Band(Band 2 + Band 3):

Antenna Type : PIFA Ant.

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 22.96dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain (dBi)	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
20	5320	7.01	5.0234	22.9631	197.8364	0.1978	1	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$

For 2.4GHz Band:

Antenna Type : PIFA Ant.

Conducted Power for IEEE 802.11ac MCS0/Nss1 (VHT20): 24.23 dBm

Distance (cm)	Test Freq. (MHz)	Directional Gain (dBi)	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
20	2437	7.02	5.0350	24.2328	265.0239	0.2656	1	Complies

Note: $Directional\ Gain = 10 \log \left[\frac{\sum_{j=1}^{N_{SS}} \left(\sum_{K=1}^{N_{ANT}} g_{j,k} \right)^2}{N_{ANT}} \right]$

For Bluetooth:

Antenna Type : PIFA Ant.

Conducted Power for BR (GFSK) 1 Mbps: 8.89 dBm

Distance (cm)	Test Freq. (MHz)	Antenna Gain (dBi)	Antenna Gain (numeric)	Average Output Power		Power Density (S) (mW/cm ²)	Limit of Power Density (S) (mW/cm ²)	Test Result
				(dBm)	(mW)			
20	2441	3.20	2.0893	8.8882	7.7414	0.0032	1	Complies

Conclusion:

Both of the 2.4GHz WLAN function, 5GHz WLAN function and Bluetooth function can transmit simultaneously, the formula of calculated the MPE is:

$$CPD1 / LPD1 + CPD2 / LPD2 + \dots \text{etc.} < 1$$

CPD = Calculation power density

LPD = Limit of power density

Mode 1 : Mode 1. 2.4GHz WLAN (Radio 1) + 2.4GHz WLAN (Radio 2) + Bluetooth (Radio 3)

Therefore, the worst-case situation is $0.2656 / 1 + 0.2656 / 1 + 0.0032 / 1 = 0.5344$, which is less than "1".

This confirmed that the device complies.

Mode 2. 2.4GHz WLAN (Radio 1) + 5GHz WLAN (Radio 2) + Bluetooth (Radio 3)

Therefore, the worst-case situation is $0.2656 / 1 + 0.2240 / 1 + 0.0032 / 1 = 0.4928$, which is less than "1".

This confirmed that the device complies.

Mode 3. 5GHz WLAN (Radio 1) + 2.4GHz WLAN (Radio 2) + Bluetooth (Radio 3)

Therefore, the worst-case situation is $0.2240 / 1 + 0.2656 / 1 + 0.0032 / 1 = 0.4928$, which is less than "1".

This confirmed that the device complies.

Mode 4. 5GHz WLAN (Radio 1) + 5GHz WLAN (Radio 2) + Bluetooth (Radio 3)

Therefore, the worst-case situation is $0.2240 / 1 + 0.2240 / 1 + 0.0032 / 1 = 0.4512$, which is less than "1".

This confirmed that the device complies.