

RF Exposure Report

Report No.: SA180529E06 R2

FCC ID: N7NBX31A

Test Model: BX3100, BX3105

Received Date: May 29, 2018

Test Date: June 30, 2018

Issued Date: Sep. 11, 2018

Applicant: Sierra Wireless Inc.

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**FCC Registration /
Designation Number:** 723255 / TW2022

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Release Control Record

Issue No.	Description	Date Issued
SA180529E06	Original release.	July 19, 2018
SA180529E06 R1	Add SAR test evaluation	Aug. 22, 2018
SA180529E06 R2	Modify the MPE value	Sep. 11, 2018

1 Certificate of Conformity

Product: AirPrime BX310x module

Brand: Sierra Wireless Inc.

Test Model: BX3100, BX3105

Sample Status: ENGINEERING SAMPLE

Applicant: Sierra Wireless Inc.

Test Date: June 30, 2018

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.1-1992

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

Prepared by : Wendy Wu , **Date:** Sep. 11, 2018
Wendy Wu / Specialist

Approved by : May Chen , **Date:** Sep. 11, 2018
May Chen / Manager

2 RF Exposure (Mobile Device)

2.1 Limits For Maximum Permissible Exposure (MPE)

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm ²)	Average 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

2.2 MPE Calculation Formula

$$Pd = (Pout * G) / (4 * \pi * r^2)$$

where

Pd = power density in mW/cm²

Pout = output power to antenna in mW

G = gain of antenna in linear scale

Pi = 3.1416

R = distance between observation point and center of the radiator in cm

2.3 Classification

The antenna of this product, under normal use condition, is at least 20m away from the body of the user.
So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

For Model No.: BX3100

Ant No.	Brand	Model	Antenna Net Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector Type
1	RF Solutions	ANT-24G-S21	0	2.4~2.4835	Monopole	SMA
2	MobileMark	CVS-2400	2.5	2.4~2.4835	Dipole	SMA
3	GemWave	FSD_BL3404-50T	1.5	2.4~2.4835	Dipole	SMA
4	Molex	PS-47950-011-001	2.27	2.4~2.4835 5.15~5.85	Dipole	i-pex(MHF)
5	RF Solutions	ANT-24G-DPL-2	2.21	2.4~2.4835	Dipole	SMA

For Model No.: BX3105

Ant No.	Brand	Model	Antenna Net Gain (dBi)	Frequency rang (GHz)	Antenna type	Connector Type
1	Sierra Wireless Inc.	BX3105	-1.65	2.4~2.4835	PIFA	NA

2.5 Calculation Result of Maximum Conducted Power

Operation Mode	Evaluation Frequency (MHz)	Max Power (mW)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN 2.4GHz	2437	100	2.50	20	0.03538	1
BT-EDR	2441	2.818	2.50	20	0.00100	1
BT-LE	2440	2.818	2.50	20	0.00100	1

NOTE: 1. This power include tune-up tolerance range that specified in Tune Up power table

3 RF Exposure (Standalone SAR test exclusion considerations)

3.1 Evaluation Result

Following FCC KDB 447498 D01 “General SAR test exclusion guidance”

The corresponding SAR Exclusion Threshold condition, listed below:

- 1) The 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at test separation distances ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}]$$

$$\leq 3.0 \text{ for 1-g SAR and } \leq 7.5 \text{ for 10-g extremity SAR, where}$$
 - $f(\text{GHz})$ is the RF channel transmit frequency in GHz.
 - Power and distance are rounded to the nearest mW and mm before calculation.
 - The result is rounded to one decimal place for comparison. The test exclusions are applicable only when the minimum test separation distance is ≤ 50 mm and for transmission frequencies between 100 MHz and 6 GHz. When the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion.
- 2) At 100 MHz to 6 GHz and for test separation distances > 50 mm, the SAR test exclusion threshold is determined according to the following:
 - a) [Threshold at 50 mm in step 1) + (test separation distance - 50mm) · ($f(\text{MHz})/150$)] mW, at 100MHz to 1500 MHz
 - b) [Threshold at 50 mm in step 1) + (test separation distance - 50 mm) · 10] mW at > 1500 MHz and ≤ 6 GHz
- 3) At frequencies below 100 MHz, the following may be considered for SAR test exclusion.
 - a) The threshold at the corresponding test separation distance at 100 MHz in step 2) is multiplied by $[1 + \log(100/f(\text{MHz}))]$ for test separation distances > 50 mm and < 200 mm.
 - b) The threshold determined by the equation in a) for 50 mm and 100 MHz is multiplied by $\frac{1}{2}$ for test separation distances ≤ 50 mm.
 - c) SAR measurement procedures are not established below 100 MHz. When SAR test exclusion cannot be applied, a KDB inquiry is required to determine SAR evaluation requirements for any test results to be acceptable.

3.2 SAR Test Exclusion Thresholds (For 1-g head or body)

For WLAN

Frequency (MHz)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 1)	1-g SAR test exclusion thresholds	Result
2412~2462	100	60	2.602	3	Pass

NOTE: 1. Calculate SAR test exclusion thresholds from condition “1” formulas.

For BT-EDR

SAR Test Exclusion Thresholds

Frequency (MHz)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 1)	1-g SAR test exclusion thresholds	Result
2402 ~ 2480	2.818	60	0.074	3	Pass

NOTE: 1. Calculate SAR test exclusion thresholds from condition “1” formulas.

For BT-LE

SAR Test Exclusion Thresholds

Frequency (MHz)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 1)	1-g SAR test exclusion thresholds	Result
2402 ~ 2480	2.818	60	0.074	3	Pass

NOTE: 1. Calculate SAR test exclusion thresholds from condition “1” formulas.

3.3 SAR Test Exclusion Thresholds (For 10-g extremity)

For WLAN

Frequency (MHz)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 1)	10-g extremity SAR test exclusion thresholds	Result
2412~2462	100	25	6.244	7.5	Pass

NOTE: 1. Calculate SAR test exclusion thresholds from condition “1” formulas.

For BT-EDR

SAR Test Exclusion Thresholds

Frequency (MHz)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 1)	10-g extremity SAR test exclusion thresholds	Result
2402 ~ 2480	2.818	25	0.178	7.5	Pass

NOTE: 1. Calculate SAR test exclusion thresholds from condition “1” formulas.

For BT-LE

SAR Test Exclusion Thresholds

Frequency (MHz)	Max. Power (mW)	Min. test separation distance (mm)	SAR test exclusion calculation value ^(NOTE 1)	10-g extremity SAR test exclusion thresholds	Result
2402 ~ 2480	2.818	25	0.178	7.5	Pass

NOTE: 1. Calculate SAR test exclusion thresholds from condition “1” formulas.

4 Conclusion

Since Source-base time average power is below SAR test exclusion power thresholds, the SAR evaluation is not required.

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