

RF Exposure Report

Report No.: SA190919D02

FCC ID: P27NA503S

Test Model: NA503S-4G

Series Model: NA503S-4Gxxxxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "- " , for marketing purpose)

Received Date: Sep. 19, 2019

Test Date: Sep. 26 to Dec. 5, 2019

Issued Date: Dec. 6, 2019

Applicant: Sercomm Corp.

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Issued By: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch
Lin Kou Laboratories

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Designation Number: 198487 / TW2021



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Release Control Record

Issue No.	Description	Date Issued
SA190919D02	Original release.	Dec. 6, 2019

1 Certificate of Conformity

Product: Multiple RF Home Gateway

Brand: Craftsman

Test Model: NA503S-4G

Series Model: NA503S-4Gxxxxxxxx (the 1st x should be "blank" or "-"; the rest x could be 0 to 9, A to Z, "blank" or "- " , for marketing purpose)

Sample Status: Engineering sample

Applicant: Sercomm Corp.

Test Date: Sep. 26 to Dec. 5, 2019

Standards: FCC Part 2 (Section 2.1091)

KDB 447498 D01 General RF Exposure Guidance v06

IEEE C95.3 -2002

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 RF characteristics under the conditions specified in this report.

Prepared by :

Annie Chang

Date:

Dec. 6, 2019

Annie Chang / Senior Specialist

Approved by :

Rex Lai

Date:

Dec. 6, 2019

Rex Lai / Associate Technical Manager

2 RF Exposure

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

$$Pd = (P_{out} * G) / (4 * \pi * r^2)$$

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 20cm away from the body of the user.

So, this device is classified as **Mobile Device**.

2.4 Antenna Gain

Function	Ant. No.	Frequency Band (MHz)	Antenna Type	Antenna Connector	Gain (dBi)	
					Chian 0	Chian 1
WCDMA Band 2	Ant. 1 & 2	1852.4-1907.6	PIFA	I-PEX	3.00	2.49
WCDMA Band 5		826.4-846.6	PIFA	I-PEX	-0.66	0.03
LTE Band 2		1850.7-1909.3	PIFA	I-PEX	3.00	2.49
LTE Band 4		1710.7-1754.3	PIFA	I-PEX	1.87	2.58
LTE Band 5		824.7-848.3	PIFA	I-PEX	-0.66	0.03
LTE Band 12		699.7-715.3	PIFA	I-PEX	-0.45	-0.63
LTE Band 13		779.5-784.5	PIFA	I-PEX	-0.14	0.76
WLAN	Ant. 3 & 4	2412-2462	Dipole	I-PEX	2.65	2.94
WLAN		5180-5240	Dipole	I-PEX	2.56	2.82
WLAN		5745-5825	Dipole	I-PEX	3.20	2.85
BT LE	Ant. 5	2402-2480	Dipole	I-PEX	3.74	-
Zigbee	Ant. 6	2405-2480	Dipole	I-PEX	3.95	-
Z-Wave	Ant. 7	908.4, 916.0	PIFA	N/A	1.26	-

2.5 Calculation Result Of Maximum Conducted Power

Function	Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN	2412-2462	27.78	5.81	20	0.454705	1
WLAN	5180-5240	17.18	5.70	20	0.038613	1
WLAN	5745-5825	18.61	6.04	20	0.058040	1
Z-Wave	908.4, 916.0	-7.10	-	20	0.000039	1
Zigbee	2405-2480	12.65	3.95	20	0.009093	1
BT LE	2402-2480	12.98	3.74	20	0.009348	1

Note:

2.4GHz Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.81\text{dBi}$

5.0GHz Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.70\text{dBi}$ (For 5180-5240MHz)

5.0GHz Directional gain = $10\log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 6.04\text{dBi}$ (For 5745-5825MHz)

Z-Wave Max Power (dBm): $88.13\text{dBuV/m} = -7.10\text{dBm}$

The Max Power = Max tune up power

Frequency Band (MHz)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WCDMA Band 2: 1852.4-1907.6MHz	23.90	20	0.048835	1
LTE Band 2: 1850.7-1909.3MHz	25.30	20	0.067411	1
LTE Band 4: 1710.7-1754.3MHz	24.50	20	0.056070	1

Frequency Band (MHz)	ERP (dBm)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WCDMA Band 5: 826.4-846.6MHz	23.40	25.55	20	0.071405	0.55
LTE Band 5: 824.7-848.3MHz	23.20	25.35	20	0.068191	0.55
LTE Band 12: 699.7-715.3MHz	22.00	24.15	20	0.051729	0.47
LTE Band 13: 779.5-784.5MHz	21.10	23.25	20	0.042047	0.52

Note: EIRP = ERP + 2.15

NOTE: Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

Conclusion:

The formula of calculated the MPE is:

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

CPD = Calculation power density

LPD = Limit of power density

WLAN 2.4GHz + WLAN 5GHz + Z-Wave + Zigbee + BT LE + WCDMA Band 5

$= 0.454705/1 + 0.058040/1 + 0.000039/1 + 0.009093/1 + 0.009348/1 + 0.071405/0.55 = 0.661054$

Therefore the maximum calculations of above situations are less than the "1" limit.

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