

RF Exposure Report

Report No.: SA180919D02

FCC ID: P27-SOR4105T

Test Model: SOR4105T

Received Date: Sep. 19, 2018

Test Date: Oct. 5 ~ Nov. 27, 2018

Issued Date: Dec. 12, 2018

Applicant: Sercomm Corp.

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Release Control Record

Issue No.	Description	Date Issued
SA180919D02	Original release.	Dec. 12, 2018

1 Certificate of Conformity

Product: Harman Magic Box

Brand: Sprint & Harman Kardon

Test Model: SOR4105T

Sample Status: Engineering sample

Applicant: Sercomm Corp.

Test Date: Oct. 5 ~ Nov. 27, 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 RF characteristics under the conditions specified in this report.

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, Date: Dec. 12, 2018

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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				
300-1500	F/1500	30
1500-100,000	1.0	30

F = Frequency in MHz

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 20cm away from the body of the user.

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

2.4 Calculation Result Of Maximum Conducted Power

Sercomm module (WiFi):

Function	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN (2412-2462MHz)	26.06	6.22	20	0.3363	1
WLAN (5180-5240MHz)	25.28	6.37	20	0.2909	1
WLAN (5745-5825MHz)	25.67	6.35	20	0.3168	1

NOTE:

2.4GHz Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 6.22\text{dBi}$

5.0GHz Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 6.37\text{dBi}$ (For 5180-5240MHz)

5.0GHz Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 6.35\text{dBi}$ (For 5745-5825MHz)

The Max Power = Max tune up power

Samsung module (FCC ID: A3LSIP005AFS30) (WiFi + BT + Zigbee):

Function	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
WLAN (2412-2462MHz)	15.00	3.8	20	0.0151	1
WLAN (5180-5240MHz)	13.50	5.5	20	0.0158	1
WLAN (5250-5350MHz)	13.50	5.5	20	0.0158	1
WLAN (5470-5725MHz)	13.50	5.5	20	0.0158	1
WLAN (5745-5825MHz)	10.50	5.5	20	0.0079	1
Bluetooth	7.5	3.8	20	0.0027	1
Bluetooth LE	6.50	3.8	20	0.0021	1
Zigbee (Dipole)	16.50	3.8	20	0.0213	1
Zigbee (FLEX)	16.50	3.2	20	0.0186	1

NOTE:

2.4GHz Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 3.8\text{dBi}$

5.0GHz Directional gain = $10 \log[(10^{G1/20} + 10^{G2/20} + \dots + 10^{GN/20})^2 / 2] = 5.5\text{dBi}$

The Max Power = Max tune up power

Frequency Band (MHz)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
LTE Band 25: 1852.5~1912.5MHz, 1855~1910MHz	28.94	20	0.1559	1

Frequency Band (MHz)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
LTE Band 41_BTS: 2510~2560MHz, 2630~2680MHz	29.48	20	0.1765	1

Frequency Band (MHz)	EIRP (dBm)	Distance (cm)	Power Density (mW/cm ²)	Limit (mW/cm ²)
LTE Band 41_CPE: 2502.5~2567.5MHz, 2622.5~2687.5MHz 2505.0~2565.0MHz, 2625.0~2685.0MHz 2507.5~2562.5MHz, 2627.5~2682.5MHz 2510.0~2560.0MHz, 2630.0~2680.0MHz	32.09	20	0.3219	1

NOTE: BTS Band 41 low band and CPE Band 41 low band cannot transmit at same time.
 BTS Band 41 high band and CPE Band 41 high band cannot transmit at same time.
 CPE mode & Sercomm WiFi module cannot transmit at same time.
 Sercomm WiFi module 2.4GHz & 5.0GHz cannot transmit at same time.
 Samsung WiFi module 2.4GHz & 5.0GHz & BT cannot transmit at same time.
 Sercomm WiFi module 2.4GHz and Samsung WiFi module 2.4GHz cannot transmit at same time.
 Sercomm WiFi module 5.0GHz and Samsung WiFi module 5.0GHz cannot transmit at same time.

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

$$\text{BTS Band 41} + \text{CPE Band 25} + \text{Samsung module (2.4G WiFi + Zigbee)} =$$

$$0.1765 + 0.1559 + 0.0151 + 0.0213 = 0.3688$$

$$\text{BTS Band 41} + \text{CPE Band 41} + \text{Samsung module (2.4G WiFi + Zigbee)} =$$

$$0.1765 + 0.3219 + 0.0151 + 0.0213 = 0.5348$$

$$\text{BTS Band 41} + \text{CPE Band 41} + \text{Samsung module (5.0G WiFi + Zigbee)} =$$

$$0.1765 + 0.3219 + 0.0158 + 0.0213 = 0.5355$$

$$\text{BTS Band 41} + \text{CPE Band 41} + \text{Samsung module (Bluetooth + Zigbee)} =$$

$$0.1765 + 0.3219 + 0.0027 + 0.0213 = 0.5224$$

$$\text{BTS Band 41} + \text{CPE Band 41} + \text{Samsung module (Bluetooth LE + Zigbee)} =$$

$$0.1765 + 0.3219 + 0.0021 + 0.0213 = 0.5218$$

$$\text{BTS Band 41} + \text{Sercomm module (5.0G WiFi)} + \text{Samsung module (Bluetooth LE + Zigbee)} =$$

$$0.1765 + 0.3168 + 0.0021 + 0.0213 = 0.5167$$

$$\text{BTS Band 41} + \text{Sercomm module (5.0G WiFi)} + \text{Samsung module (2.4G WiFi + Zigbee)} =$$

$$0.1765 + 0.3168 + 0.0151 + 0.0213 = 0.5297$$

$$\text{BTS Band 41} + \text{Sercomm module (2.4G WiFi)} + \text{Samsung module (5.0G WiFi + Zigbee)} =$$

$$0.1765 + 0.3363 + 0.0158 + 0.0213 = 0.5499$$

$$\text{BTS Band 41} + \text{Sercomm module (2.4G WiFi)} + \text{Samsung module (Bluetooth + Zigbee)} =$$

$$0.1765 + 0.3363 + 0.0027 + 0.0213 = 0.5368$$

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

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