RF Exposure Report

Report No.:	SA190925C38
FCC ID:	WIYQSC20A (For module) WIYSATURN1KU (For Host)
Original FCC ID:	XMR201706SC20A
Test Model:	SC20-A
Received Date:	Sep. 25, 2019
Date of Evaluation:	Oct. 30, 2019
Issued Date:	Oct. 30, 2019
Applicant:	CASTLES TECHNOLOGY CO., LTD.
Address:	6F, NO. 207-5, SEC. 3, BEIXIN RD., XINDIAN DISTRICT, NEW TAIPEI CITY 23143, TAIWAN (R. O. C.)
Issued By:	Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch Lin Kou Laboratories
Lab Address:	No. 47-2, 14th Ling, Chia Pau Vil., Lin Kou Dist., New Taipei City, Taiwan
Test Location:	No. 19, Hwa Ya 2nd Rd., Wen Hwa Vil., Kwei Shan Dist., Taoyuan City 33383, TAIWAN
FCC Registration / Designation Number:	788550 / TW0003

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Release Control Record

Issue No.	Description	Date Issued
SA190925C38	Original release.	Oct. 30, 2019

1 Certificate of Conformity

Product:	LTE module (for module)
	POS Terminal (For Host)
Brand:	Quectel (for module)
	CASTLES TECHNOLOGY (For Host)
Test Model:	SC20-A (for module)
	SATURN1000-E UPT (For Host)
Sample Status:	Identical Prototype
Applicant:	CASTLES TECHNOLOGY CO., LTD.
Date of Evaluation:	Oct. 30, 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 : Polly Chen , **Date:** Oct. 30, 2019

Polly Chien / Specialist

Approved by : Bruce Chen , **Date:** Oct. 30, 2019

Bruce Chen / Senior Project Engineer

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

$Pd = (Pout*G) / (4*pi*r^2)$
where
Pd = power density in mW/cm^2
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.

3 Calculation Result of Maximum Conducted Power

For module (Model: SC20-A, FCC ID: XMR201706SC20A)

Frequency Band (MHz)	Max Power (dBm)	Antenna Gain (dBi)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
2.4G WLAN	21.64	2.6	20	0.053	1
5G WLAN	13.71	4.9	20	0.014	1
2.4G Bluetooth	7.93	2.6	20	0.002	1

Frequency Band (MHz)	Output Power ERP / EIRP (dBm)	Output Power ERP / EIRP (mW)	Distance (cm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
GSM850	30.1	1023.293	20	0.204	0.55
GSM1900	31.1	1288.250	20	0.256	1
WCDMA Band 2	24.8	301.995	20	0.060	1
WCDMA Band 4	25.6	363.078	20	0.072	0.55
WCDMA Band 5	20.1	102.329	20	0.020	1
LTE Band 2	23.6	229.087	20	0.046	1
LTE Band 4	22.3	169.824	20	0.034	1
LTE Band 5	21.1	128.825	20	0.026	0.55
LTE Band 7	22.9	194.984	20	0.039	1
LTE Band 12	23.1	204.174	20	0.041	0.47
LTE Band 13	23.2	208.930	20	0.042	0.52
LTE Band 25	24.4	275.423	20	0.055	1
LTE Band 26	22.8	190.546	20	0.038	0.54

For Host:

Mode	Electric field (dBuV/m) @3m	Electric field (dBuV/m) @10m	Electric field (dBuV/m) @0.2m	Max Power (dBm)	Power Density (mW/cm^2)	Limit (mW/cm^2)
NFC	64.4	53.94	121.90	3.15	0.0004	0.978

Note:
1. The above Max Power is Turn-up Power which client declared.
2. The WLAN 2.4GHz and WLAN 5GHz cannot transmit simultaneously.
3. The WLAN 2.4GHz and Bluetooth cannot transmit simultaneously.
4. Determining compliance based on the results of the compliance measurement, not taking into account measurement instrumentation uncertainty.

For antenna gain:

Frequency Band	Antenna Gain (dBi)
2.4G WLAN	2.6
5G WLAN	4.9
698-791MHz	0.85
824-960MHz	-0.68
1710-2170MHz	-0.08
2500-2700MHz	0.59

Conclusion:

The formula of calculated the MPE is:

CPD1 / LPD1 + CPD2 / LPD2 + ……etc. < 1

CPD = Calculation power density

LPD = Limit of power density

1. WLAN + WWAN = 0.053/1 + 0.256/1 = 0.053+0.256=0.309
2. WWAN + BT = 0.256/1 + 0.002/1 = 0.256+0.002=0.258
3. WLAN + WWAN + NFC = 0.053/1 + 0.256/1 + 0.0004/0.978 = 0.053+0.256+0.0004=0.3094
4. WWAN + BT + NFC = 0.053/1 + 0.002/1 + 0.0004/0.978 = 0.053+0.002+0.0004=0.0554

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

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