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RF Exposure Evaluation Report

Application No.:	SHCR2201000300HS
FCC ID:	2AMH4SC20A
IC:	29364-SC20A
Applicant:	Motocaddy Ltd.
Address of Applicant:	Units 15 to 18, Stansted Distribution Centre Start Hill Great Hallingbury Hertfordshire CM22 7DG United Kingdom
Manufacturer:	Motocaddy Ltd.
Address of Manufacturer:	Units 15 to 18, Stansted Distribution Centre Start Hill Great Hallingbury Hertfordshire CM22 7DG United Kingdom
Equipment Under Test (EUT):	
EUT Name:	LTE Module
Model No.:	SC20-A
HVIN:	SC20-A (REV1)
Standard(s) :	FCC Rules 47 CFR §2.1091 KDB447498 D01 General RF Exposure Guidance v06 RSS-102 Issue 5 Amendment 1 (February 2, 2021)
Date of Receipt:	2022-11-09
Date of Test:	2022-11-10 to 2022-11-17
Date of Issue:	2022-12-21
Test Result:	**Pass***

* In the configuration tested, the EUT complied with the standards specified above.

Parlam Zhan
Laboratory Manager

Revision Record			
Version	**Description**	**Date**	**Remark**
00	Original	2022-12-21	/

Authorized for issue by:				
		Wade Zhang		
		Wade Zhang/Project Engineer		
		Parlam Zhan		
		Parlam Zhan / Reviewer		

2 Contents

3 General Information

3.1 General Description of E.U.T.

Power supply:	DC 3.8V By test Board
S/N:	ESN 8901170327
Firmware Version:	SC20ASAR04A03H8G

3.2 Technical Specifications

Antenna Gain:

WWAN Antenna	Main Antenna 1	Aux Antenna 2
Gain (GSM850)	0.4dBi	0.9dBi
Gain (PCS1900)	2.3dBi	1.5dBi
Gain (WCDMA Band II)	2.3dBi	1.5dBi
Gain (WCDMA Band VI)	2.3dBi	1.5dBi
Gain (WCDMA Band V)	0.4dBi	0.9dBi
Gain (LTE Band 2)	2.3dBi	1.5dBi
Gain (LTE Band 4)	2.3dBi	1.5dBi
Gain (LTE Band 5)	0.4dBi	0.9dBi
Gain (LTE Band 7)	2.0dBi	1.9dBi
Gain (LTE Band 12)	0.4dBi	0.9dBi
Gain (LTE Band 13)	0.4dBi	0.9dBi
Gain (LTE Band 25)	2.3dBi	1.5dBi
Gain (LTE Band 26)	0.4dBi	0.9dBi

2.4G WIFI/BT Antenna Gain: 2.2 dBi

5G WIFI Antenna Gain: 3.8 dBi

(Provided by manufacturer)

Antenna Type:	FPC Antenna
Device Operating Configurations:	
Modulation Mode:	GSM: GMSK, 8PSK WCDMA: QPSK, 16QAM LTE: QPSK, 16QAM WIFI: DSSS, OFDM BT: GFSK, π/4DQPSK, 8DPSK BLE: GFSK

Frequency Bands:

Band	Tx (MHz)	Rx (MHz)
GSM850	824-849	869-894
GSM1900	1850-1910	1930-1990
WCDMA Band II	1850-1910	1930-1990

WCDMA Band IV	1710-1755	2110- 2155
WCDMA Band V	824-849	869-894
LTE Band 2	1850-1910	1930-1990
LTE Band 4	1710-1755	2110- 2155
LTE Band 5	824-849	869-894
LTE Band 7	2500-2570	2620- 2690
LTE Band 12	699-716	729-746
LTE Band 13	777-787	746-756
LTE Band 25	1850-1915	1930-1995
LTE Band 26	814-849	859-894
WIFI2.4G	2412-2462	2412-2462
BT	2402-2480	2402-2480
WIFI(U-NII-1)	5150~5250	5150~5250
WIFI(U-NII-2A)	5250~5350	5250~5350
WIFI(U-NII-2C)	5470~5725	5470~5725
WIFI(U-NII-3)	5725~5850	5725~5850

Note:
The antenna gain value is provided by the customer. The test lab will not be responsible for wrong test result due to incorrect information about antenna gain values.

3.3 Test Location

All tests were performed at:
SGS-CSTC Standards Technical Services Co., Ltd. Shanghai Branch
588 West Jindu Road, Xinqiao, Songjiang, 201612 Shanghai, China.
Tel: +86 21 6191 5666
Fax: +86 21 6191 5678
No tests were sub-contracted.
Note:
1. SGS is not responsible for wrong test results due to incorrect information (e.g. max. clock frequency, highest internal frequency, antenna gain, cable loss, etc) is provided by the applicant. (if applicable).
2. SGS is not responsible for the authenticity, integrity and the validity of the conclusion based on results of the data provided by applicant. (if applicable).

3.4 Test Facility

The test facility is recognized, certified, or accredited by the following organizations:

- **A2LA (Certificate No. 6332.01)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. is accredited by the American Association for Laboratory Accreditation(A2LA).

- **FCC (Designation Number: CN1301)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been recognized as an accredited testing laboratory.

- **ISED (CAB Identifier: CN0020)**

SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. EMC Laboratory has been recognized by Innovation, Science and Economic Development Canada (ISED) as an accredited testing laboratory Company Number: 8617A

- **VCCI (Member No.: 3061)**

The 3m Semi-anechoic chamber and Shielded Room of SGS-CSTC Standards Technical Services (Shanghai) Co., Ltd. has been registered in accordance with the Regulations for Voluntary Control Measures with Registration No.: R-13868, C-14336, T-12221, G-10830 respectively.

4 Test Standards and Limits

4.1 FCC Radiofrequency radiation exposure limits:

According to§1.1310, the limit for general population/uncontrolled exposures

Frequency range (MHz)	Electric field strength (V/m)	Magnetic field strength (A/m)	Power density (mW/cm^2)	Averaging 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/f2)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

4.2 IC Radiofrequency radiation exposure limits:

According to RSS-102 section 2.5.2, RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

below 20 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);

• at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);

• at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2}\ f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;

• at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

5 Measurement and Calculation

5.1 Maximum transmit power

The Power Data is based on the tune up and RF Test Report FG741007A&FG741007B&FR741007A& FR741007B&FR741007C&FR741007D &FR741007E&FW741007.

Mode/Band	Frequency		Tune up (dBm) (MAX)
	TX(MHz)	RX(MHz)	
WIFI 2.4G 11b	2412-2462	2412-2462	16.50
WIFI 2.4G 11g/11n	2412-2462	2412-2462	14.50
WIFI 5G U-NII-1	5150-5250	5150-5250	14.00
WIFI 5G U-NII-2A	5250~5350	5250~5350	14.00
WIFI 5G U-NII-2C	5470~5725	5470~5725	14.00
WIFI 5G U-NII-3	5725-5825	5725-5825	12.5
BT	2402-2480	2402-2480	8.20
BLE	2402-2480	2402-2480	3.10

Mode/Band	Frequency		Tune up (dBm) (MAX)
	TX(MHz)	RX(MHz)	
GSM 850	824-849	869-894	24.00 (Average)
GSM1900	1850-1910	1930-1990	21.50(Average)
WCDMA Band II	1850-1910	1930-1990	24.00
WCDMA Band IV	1710-1755	2110-2155	24.00
WCDMA Band V	824-849	869-894	24.00
LTE Band 2	1850-1910	1930-1990	24.00
LTE Band 4	1710-1755	2110-2155	24.50
LTE Band 5	824-849	869-894	24.50
LTE Band 7	2500-2570	2620-2690	24.00
LTE Band 12	699-716	729-746	24.00
LTE Band 13	777-787	746-756	24.00
LTE Band 25	1850-1915	1930-1995	24.00
LTE Band 26	814-849	859-894	24.00
The averaged power calculated method are shown as below: Averaged power=Maximum burst averaged power (1 Tx Slot)+(10lg(1/8))dB Averaged power=Maximum burst averaged power (2 Tx Slot)+(10lg(2/8))dB Averaged power=Maximum burst averaged power (3 Tx Slot)+(10lg(3/8))dB Averaged power=Maximum burst averaged power (4 Tx Slot) + (10lg(4/8))dB Average EIRP Power=Average Power + Antenna Gain			

5.2 RF Exposure Calculation

For FCC:

Band	Frequency (MHz)	Antenna Gain	Gain in Linear Scale	Operation Distance	Max Tune-up power	Max Tune-up power	Power Density	Limit	Result
Information		(dBi)	G	R(cm)	(dBm)	(mW)	(mW/cm²)	(mW/cm²)	
GSM 850	824.2	0.9	1.23	20	24.0	249.46	0.061	0.55	Pass
GSM 1900	1850.2	2.3	1.70	20	21.5	140.28	0.047	1	Pass
WCDMA Band 2	1852.4	2.3	1.70	20	24	251.19	0.085	1	Pass
WCDMA Band 4	1712.4	2.3	1.70	20	24	251.19	0.085	1	Pass
WCDMA Band 5	826.4	0.9	1.23	20	24	251.19	0.061	0.55	Pass
LTE Band 2	1850.7	2.3	1.70	20	24	251.19	0.085	1	Pass
LTE Band 4	1710.7	2.3	1.70	20	24.5	281.84	0.095	1	Pass
LTE Band 5	824.7	0.9	1.23	20	24.5	281.84	0.069	0.55	Pass
LTE Band 7	2502.5	2	1.58	20	24	251.19	0.079	1	Pass
LTE Band 12	699.7	0.9	1.23	20	24	251.19	0.061	0.47	Pass
LTE Band 13	779.5	0.9	1.23	20	24	251.19	0.061	0.52	Pass
LTE Band 25	1850.7	2.3	1.70	20	24	251.19	0.085	1	Pass
LTE Band 26	814.7	0.9	1.23	20	24	251.19	0.061	0.54	Pass
BT	2402	2.2	1.66	20	8.2	6.61	0.002	1	Pass
BLE	2402	2.2	1.66	20	3.1	2.04	0.001	1	Pass
2.4G WiFi	2412	2.2	1.66	20	16.5	44.67	0.015	1	Pass
5G WiFi	5180	3.8	2.40	20	14	25.12	0.012	1	Pass

The BT,WiFi and LTE can transmit simultaneously, but the maximum rate of MPE is 0.002/1+0.012/1+0.061/0.47=0.144≤1, So, the device is exclusion from SAR test.

For IC:

Band Information	Frequency (MHz)	Antenna Gain (dBi)	Max Tune-up power (dBm)	Maximum E.I.R.P. (dBm)	Maximum E.I.R.P. (W)	IC Limit (W)	Result
GSM 850	824.2	0.9	24.0	24.87	0.307	1.29	Pass
GSM 1900	1850.2	2.3	21.5	23.77	0.238	2.24	Pass
WCDMA Band 2	1852.4	2.3	24.0	26.3	0.427	2.24	Pass
WCDMA Band 4	1712.4	2.3	24.0	26.3	0.427	2.12	Pass
WCDMA Band 5	826.4	0.9	24.0	24.9	0.309	1.29	Pass
LTE Band 2	1850.7	2.3	24.0	26.3	0.427	2.24	Pass
LTE Band 4	1710.7	2.3	24.5	26.8	0.479	2.12	Pass
LTE Band 5	824.7	0.9	24.5	25.4	0.347	1.29	Pass
LTE Band 7	2502.5	2.0	24.0	26	0.398	2.75	Pass
LTE Band 12	699.7	0.9	24.0	24.9	0.309	1.15	Pass
LTE Band 13	779.5	0.9	24.0	24.9	0.309	1.24	Pass
LTE Band 25	1850.7	2.3	24.0	26.3	0.427	2.24	Pass
LTE Band 26	814.7	0.9	24.0	24.9	0.309	1.28	Pass
BT	2402	2.2	8.2	10.4	0.011	2.68	Pass
BLE	2402	2.2	3.1	5.3	0.003	2.68	Pass
2.4G WiFi	2412	2.2	16.5	18.7	0.074	2.68	Pass
5G WiFi	5180	3.8	14.0	17.8	0.060	4.53	Pass

The BT,WiFi and LTE can simultaneous transmitting, so the maximum rate of MPE is

0.011/2.68+0.060/4.53+0.309/1.15=0.286≤1.

So the device is exclusion from SAR test

--End of the Report--