EMF TEST REPORT

Test Report No. : **OT-237-RWD-065**

Reception No. : **2306001881**

Applicant : **SEGI LIMITED**

Address : **Unit J2, 4/F, Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, HONGKONG, China**

Manufacturer : **SEGI R&D LIMITED**

Address : **C-709, Bupyeong Woolim lions valley, 283, Bupyeong-daero, Bupyeong-gu, Incheon, Republic of Korea**

Type of Equipment : **Dash cam**

FCC ID. : **VA5CLC345-XC**

Model Name : **DR-XC**

Multiple Model Name : **N/A**

Serial number : **N/A**

Total page of Report : **10 pages (including this page)**

Date of Incoming : **June 26, 2023**

Date of issue : **July 28, 2023**

SUMMARY

The equipment complies with the regulation; ***FCC CFR 47 PART 1.1310***

This test report only contains the result of a single test of the sample supplied for the examination.

It is not a generally valid assessment of the features of the respective products of the mass-production.

This report is not correlated with the "KS Q ISO/IEC 17025 and KOLAS accreditation" of Korean Laboratory Accreditation Scheme.

Tested by	Reviewed by	Approved by
Myeong-Hwa, Jang / Sr. Engineer	Tae-Ho, Kim / Chief Engineer	Jae-Ho, Lee / Chief Engineer
ONETECH Corp.	ONETECH Corp.	ONETECH Corp.

ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

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ONETECH Corp.: 43-14, Jinsaegol-gil, Chowol-eup, Gwangju-si, Gyeonggi-do, 12735, Korea (TEL: 82-31-799-9500, FAX: 82-31-799-9599)

Revision History

Rev. No.	Issue Report No.	Issued Date	Revisions	Section Affected
0	OT-237-RWD-065	July 28, 2023	Initial Release	All

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1. VERIFICATION OF COMPLIANCE

Applicant : SEGI LIMITED

Address : Unit J2, 4/F, Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories, HONGKONG, China

Contact Person : Youngil Chang / President

Telephone No. : +85-2-2682-6432

FCC ID : VA5CLC345-XC

Model Name : DR-XC

Brand Name : N/A

Serial Number : N/A

Date : July 28, 2023

EQUIPMENT CLASS	DTS – DIGITAL TRNSMISSION SYSTEM
E.U.T. DESCRIPTION	Dash cam
THIS REPORT CONCERNS	Original Grant
MEASUREMENT PROCEDURES	ANSI C63.10: 2013
TYPE OF EQUIPMENT TESTED	Pre-Production
KIND OF EQUIPMENT AUTHORIZATION REQUESTED	Certification
EQUIPMENT WILL BE OPERATED UNDER FCC RULES PART(S)	FCC PART 15 SUBPART C Section 15.247 KDB 558074 D01 15.247 Meas Guidance v05r02
Modifications on the Equipment to Achieve Compliance	None
Final Test was Conducted On	3 m, Semi Anechoic Chamber

-. The above equipment was tested by ONETECH Corp. for compliance with the requirement set forth in the FCC Rules and Regulations. This said equipment in the configuration described in this report, shows the maximum emission levels emanating from equipment are within the compliance requirements.

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2. GENERAL INFORMATION

2.1 Product Description

The SEGI LIMITED, Model DR-XC (referred to as the EUT in this report) is a Dash cam. The product specification described herein was obtained from product data sheet or user's manual.

DEVICE TYPE	Dash cam		
Temperature Range	-20 °C ~ 70 °C		
OPERATING FREQUENCY	LTE Band 2	TX	1 850 MHz ~ 1 910 MHz
		RX	1 930 MHz ~ 1 990 MHz
	LTE Band 4	TX	1 710 MHz ~ 1 755 MHz
		RX	2 110 MHz ~ 2 155 MHz
	LTE Band 12	TX	699 MHz ~ 716 MHz
		RX	729 MHz ~ 746 MHz
	Bluetooth LE	2 402 MHz ~ 2 480 MHz	
	WLAN 2.4 GHz	2 412 MHz ~ 2 472 MHz (802.11b/g/n(HT20))	
		2 422 MHz ~ 2 462 MHz (802.11n(HT40))	
MODULATION TYPE	LTE	QPSK, 16QAM	
	Bluetooth LE	GFSK for 1 Mbps	
	WLAN 2.4 GHz	802.11b: DSSS Modulation(DBPSK/DQPSK/CCK) 802.11g/n(HT20)/n(HT40): OFDM Modulation(BPSK/QPSK/16QAM/64QAM)	
RF OUTPUT POWER	LTE Band 2	25.63 dBm	
	LTE Band 4	25.14 dBm	
	LTE Band 12	19.70 dBm	
	Bluetooth LE	0.06 dBm	
	WLAN 2.4 GHz	12.44 dBm(802.11b) 6.92 dBm(802.11g) 7.12 dBm(802.11n_HT20) 7.01 dBm(802.11n_HT40)	
RATED POWER	LTE Band 2	25.00 dBm	
	LTE Band 4	25.00 dBm	
	LTE Band 12	25.00 dBm	

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ANTENNA TYPE	LTE	LDS Antenna
	Bluetooth LE	Chip Antenna
	WLAN 2.4 GHz	Chip Antenna
ANTENNA GAIN	LTE Band 2	2.31 dBi
	LTE Band 4	0.63 dBi
	LTE Band 12	-1.29 dBi
	Bluetooth LE	1.69 dBi
	WLAN 2.4 GHz	1.69 dBi
List of each Osc. or crystal Freq.(Freq. >= 1 MHz)		8 MHz, 24 MHz, 38.4 MHz

2.2 Alternative type(s)/model(s); also covered by this test report.

-. None

3. EUT MODIFICATIONS

-. None

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4. MAXIMUM PERMISSIBLE EXPOSURE

4.1 RF Exposure Calculation

According to the FCC rule 1.1310 table 1B, the limit for the maximum permissible RF exposure for an uncontrolled environment are f/1500 mW/cm² for the frequency range between 300 MHz and 1 500 MHz and 1.0 mW/cm² for the frequency range between 1 500 MHz and 100 000 MHz.

The electric field generated for a 1 mW/cm² exposure is calculated as follows:

$E = \sqrt{(30 * P * G)} / d$, and $S = E^2 / Z = E^2 / 377$, because 1 mW/cm² = 10 W/m²

Where

S = Power density in mW/cm², Z = Impedance of free space, 377 Ω

E = Electric filed strength in V/m, G = Numeric antenna gain, and d = distance in meter

Combing equations and rearranging the terms to express the distance as a function of the remaining variable

$d = \sqrt{(30 * P * G) / (377 * 10 S)}$

Changing to units of mW and cm, using P (mW) = P (W) / 1 000, d (cm) = 0.01 * d (m)

$d = 0.282 * \sqrt{(P * G) / S}$

Where

d = distance in cm, P = Power in mW, G = Numeric antenna gain, and S = Power density in mW/cm²

4.2 EUT Description

Kind of EUT	Dash cam
Device Category	☐ Portable (< 20 cm separation) ■ Mobile (> 20 cm separation) ☐ Others
Exposure Evaluation Applied	■ MPE ☐ SAR ☐ N/A

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4.3 Calculated MPE Safe Distance

4.3.1 DATA for LTE

According to above equation, the following result was obtained.

Operating Mode	Operating Frequency (MHz)	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
			(dBm)	(mW)	Log	Linear			
LTE Band 2	1 880.00	25.00 ± 1.0	26.0	398.11	2.31	1.70	7.34	0.134 8	1.0
LTE Band 4	1 717.50	25.00 ± 1.0	26.0	398.11	0.63	1.16	6.05	0.091 6	1.0
LTE Band 12	715.30	25.00 ± 1.0	26.0	398.11	-1.29	0.74	4.85	0.058 8	0.476 9

According to above table, for LTE Band 2, safe distance,

$D = 0.282 * \sqrt{(398.11 * 1.70)/1.00} = 7.34$ cm.

For getting power density at 20 cm separation in above table, following formula was used.

$S = P * G / (4\pi * R^2) = 398.11 * 1.70 / (4 * \pi * 20\text{^}2) = 0.134\ 8$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

According to above table, for the frequency range between 300 MHz and 1 500 MHz, each limit,

LTE Band 12 limit = 715.30/1500 = 0.476 9 mW/cm2

4.3.2 DATA for WLAN

According to above equation, the following result was obtained.

Operating Freq. Band (MHz)	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
			(dBm)	(mW)	Log	Linear			
WLAN_2 400 ~ 2 483.5	802.11b	12.44 ± 1.0	13.44	22.08	1.69	1.48	1.61	0.006 5	1.00
	802.11g	6.92 ± 1.0	7.92	6.19			0.85	0.001 8	1.00
	802.11n_HT20	7.12 ± 1.0	8.12	6.49			0.87	0.001 9	1.00
	802.11n_HT40	7.01 ± 1.0	8.01	6.32			0.86	0.001 9	1.00

According to above table, for WLAN_2 400 ~ 2 483.5 MHz Band(802.11b), safe distance,

D = 0.282 * √ (22.08 * 1.48)/1.00 = 1.61 cm.

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 22.08 * 1.48 / (4 * \pi * 20^2) = 0.006\ 5$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

4.3.3 DATA for Bluetooth LE

According to above equation, the following result was obtained.

Operating Mode	Operating Frequency (MHz)	Target Power W/tolerance (dBm)	Max tune up power		Antenna Gain		Safe Distance (cm)	Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
			(dBm)	(mW)	Log	Linear			
Bluetooth LE	2 402.00	0.06 ± 1.0	1.06	1.28	1.69	1.48	0.39	0.000 4	1.00

According to above table, safe distance,

D = 0.282 * √ (1.28 * 1.48)/1.00 = 0.39 cm.

For getting power density at 20 cm separation in above table, following formula was used.

$$S = P * G / (4\pi * R^2) = 1.28 * 1.48 / (4 * \pi * 20^2) = 0.000\ 4$$

Where:

S = Power Density,

P = Power input to the external antenna (Output power from the EUT antenna port (dBm) – cable loss (dB)),

G = Gain of Transmit Antenna (linear gain), R = Distance from Transmitting Antenna

4.3.4 DATA for Intermodulation Transmit

According to above equation, the following result was obtained.

Intermodulation Mode	Operating Mode	Target Power W/tolerance (dBm)	Max tune up power		Power Density (mW/cm²) @ 20 cm Separation	Sum Power Density (mW/cm²) @ 20 cm Separation	Limit (mW/cm²)
			(dBm)	(mW)			
Bluetooth LE + LTE	Bluetooth LE	0.06 ± 1.0	1.06	1.28	0.000 4	0.135 2	1.00
	LTE Band 2	25.00 ± 1.0	26.0	398.11	0.134 8		
WLAN + LTE	802.11b	12.44 ± 1.0	13.44	22.08	0.006 5	0.141 3	1.00
	LTE Band 2	25.00 ± 1.0	26.0	398.11	0.134 8		