CERTIFICATION TEST REPORT

Report Number. : 4789464428-FR2V2

Applicant	:	SEGI LIMITED Unit J2, 4/F, Block 1, Kinho Industrial Building, 14-24 Au Pui Wan Street, Shatin, New Territories HONGKONG, China
Model	:	ANT-2WSF
FCC ID	:	VA5ANH500-2WLF
IC	:	7087A-2WANH500LF
EUT Description	:	Keyless Entry System
Test Standard(s)	:	FCC 47 CFR PART 15 SUBPART C INDUSTRY CANADA RSS-Gen Issue 5 INDUSTRY CANADA RSS-210 Issue 10

Date Of Issue:
July 15, 2020

Prepared by:
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Suwon Test Site: UL Korea, LTD. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
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IAS ACCREDITED
Testing Laboratory
TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	07/14/20	Initial issue	Robby Lee
V2	07/15/20	Updated about the TCB's question	Robby Lee

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1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SEGI LIMITED

EUT DESCRIPTION: Keyless Entry System

MODEL NUMBER: ANT-2WSF

SERIAL NUMBER: Proto-type

DATE TESTED: JUN 15, 2020 – JUL 14, 2020

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C INDUSTRY CANADA RSS-Gen Issue 5 INDUSTRY CANADA RSS-210 Issue 10	Pass

UL Verification Services Inc. tested the above equipment in accordance with the requirements set forth in the above standards. All indications of Pass/Fail in this report are opinions expressed by UL Verification Services Inc. based on interpretations and/or observations of test results. Measurement Uncertainties were not taken into account and are published for informational purposes only. The test results show that the equipment tested is capable of demonstrating compliance with the requirements as documented in this report.

Note: The results documented in this report apply only to the tested sample, under the conditions and modes of operation as described herein. This document may not be altered or revised in any way unless done so by UL Verification Services Inc. and all revisions are duly noted in the revisions section. Any alteration of this document not carried out by UL Verification Services Inc. will constitute fraud and shall nullify the document. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, any agency of the Federal Government, or any agency of any government.

Approved & Released For
UL Korea, Ltd. By:

CY Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Robby Lee
Suwon Lab Engineer
UL Korea, Ltd.

2. TEST METHODOLOGY

The tests documented in this report were performed in accordance with ANSI C63.10-2013, FCC CFR 47 Part 2, FCC CFR 47 Part 15 and ISED CANADA RSS-210 Issue 10 and RSS-GEN Issue 5.

3. FACILITIES AND ACCREDITATION

The test sites and measurement facilities used to collect data are located at 218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea. Line conducted emissions are measured only at the 218 address. The following table identifies which facilities were utilized for radiated emission measurements documented in this report. Specific facilities are also identified in the test results sections.

218 Maeyeong-ro
☐ Chamber 1
☐ Chamber 2
☐ Chamber 3
☒ 10m Chamber

UL Korea, Ltd. is accredited by IAS, Laboratory Code TL-637. The full scope of accreditation can be viewed at http://www.iasonline.org/PDF/TL/TL-637.pdf.

4. CALIBRATION AND UNCERTAINTY

4.1. MEASURING INSTRUMENT CALIBRATION

The measuring equipment utilized to perform the tests documented in this report has been calibrated in accordance with the manufacturer's recommendations, and is traceable to recognized national standards.

4.2. SAMPLE CALCULATION

Where relevant, the following sample calculation is provided:

Field Strength (dBuV/m) = Measured Voltage (dBuV) + Antenna Factor (dB/m) + Cable Loss (dB) – Preamp Gain (dB)

36.5 dBuV + 18.7 dB/m + 0.6 dB – 26.9 dB = 28.9 dBuV/m

4.3. MEASUREMENT UNCERTAINTY

Where relevant, the following measurement uncertainty levels have been estimated for tests performed on the apparatus:

PARAMETER	UNCERTAINTY
Conducted Disturbance, 0.15 to 30 MHz	2.35 dB
Radiated Disturbance, 9 kHz to 30 MHz	4.13 dB

Uncertainty figures are valid to a confidence level of 95%.

4.1. DECISION RULE

Decision rule for statement(s) of conformity is based on Procedure 1, Clause 4.4.2 in IEC Guide 115:2007.

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5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Keyless Entry System with 125kHz.

5.2. MAXIMUM OUTPUT POWER

Fundamental Frequency (KHz)	Mode	E field (300m distance) FCC (dBuV/m)	H field (300m distance) IC (dBuA/m)
125	Tx	14.37	-37.13

5.3. WORST-CASE CONFIGURATION

The spurious emissions was investigated in three orthogonal orientations X, Y and Z it was determined that Y orientation was worst-case orientation.

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

Support Equipment List				
Description	Manufacturer	Model	Serial Number	FCC ID/DoC
Test Jig	SEGI	N/A	N/A	N/A

I/O CABLES

I/O Cable List						
Cable No	Port	# of identical ports	Connector Type	Cable Type	Cable Length(m)	Remarks
1	DC & DATA	1	Pin	Unshielded	1.0m	From EUT to Jig

TEST SETUP

The EUT was tested in forced transmit mode using test jig.

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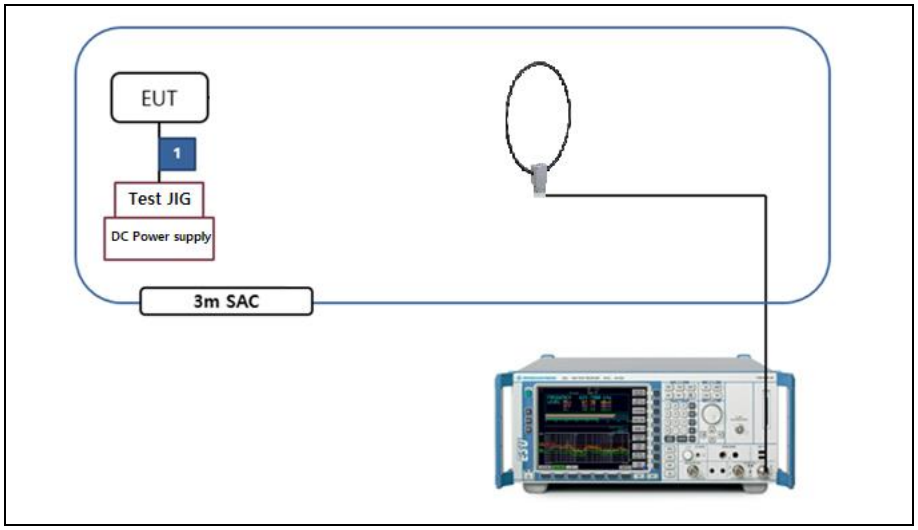
TEST SETUP DIAGRAM



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6. TEST AND MEASUREMENT EQUIPMENT

The following test and measurement equipment was utilized for the tests documented in this report:

Test Equipment List				
Description	**Manufacturer**	**Model**	**S/N**	**Cal Due**
Test Receiver	R&S	ESW44	101848	20.08.05
Active Loop Antenna	R&S	HFH2-Z2E	100900	20.09.30
Bias Unit	R&S	IN600	100974	20.09.30
Temp and Humidity recorder	LUTRON	MHB-382SD	AI.69479	20.08.08
Spectrum Analyzer	AGILENT	N9030A	MY54170614	20.08.06
Digital Multimeter	FLUKE	17B	27770596WS	20.08.06
DC power supply	KEYSIGHT	N5747A	MY57300040	20.08.06
Signal Generator	R&S	SMB100A	180032	20.08.07
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	R&S	EMC32	10.60.10	

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7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

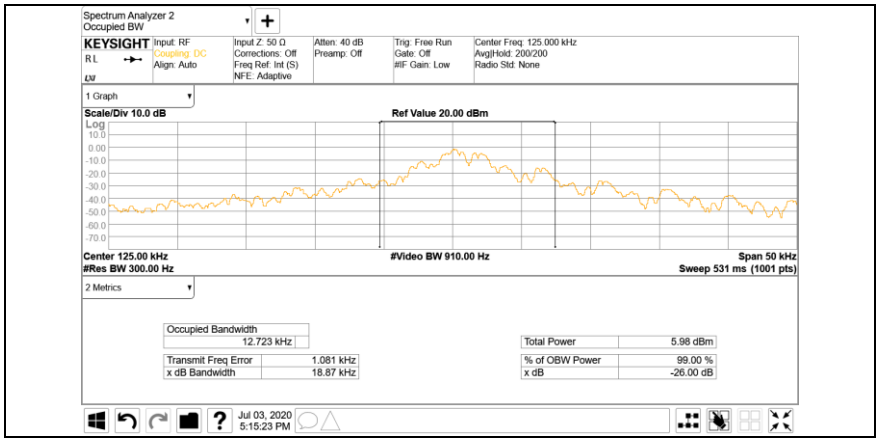
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to >= 3 times the RBW.
The spectrum analyzer internal 99% bandwidth function is utilized.

Note: The RBW setting is lowest set(1Hz) of SA, due to the too low of OBW.

RESULTS

Frequency [kHz]	99% Bandwidth [kHz]
125	12.723

99% BANDWIDTH PLOTS



7.2. RADIATED EMISSIONS

LIMIT

FCC §15.209 (a)

Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3
Note: The lower limit shall apply at the transition frequency.		

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this part, e.g. §§ 15.231 and 15.241.
§15.209 (b) In the emission table above, the tighter limit applies at the band edges.

Formula for converting the filed strength from uV/m to dBuV/m is:
Limit (dBuV/m) = 20 log limit (uV/m)

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IC RSS-GEN Sections 8.9 and 8.10.

Frequency (MHz)	Field strength (µV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Frequency (MHz)	Magnetic field strength (H-Field) (µA/m)	Measurement Distance (m)
0.009–0.490 Note 1	6.37/F (F in kHz)	300
0.490–1.705	63.7/F (F in kHz)	30
1.705–30.0	0.08	30
Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.		

Note: The limits for spurious emissions below 30 MHz in RSS GEN Section 8.9 Table 6 are given in dBuA/m while the FCC Part 15.209(a) limits are expressed in dBuV/m. Using the free space impedance of 377Ω to convert between electric and magnetic field strength (a factor of 51.5dB in logarithmic units) the two sets of limits are equivalent and therefore a measured value of X dBuV/m shown in the plots and tables is equal to a magnetic field strength of (X - 51.5) dBuA/m and the margin of that emission relative to the RSS GEN limit (FCC 15.209 limit – 51.5) dBuA/m would be the same as the margin to the FCC limit detailed in those plots/tables.

TEST PROCEDURE

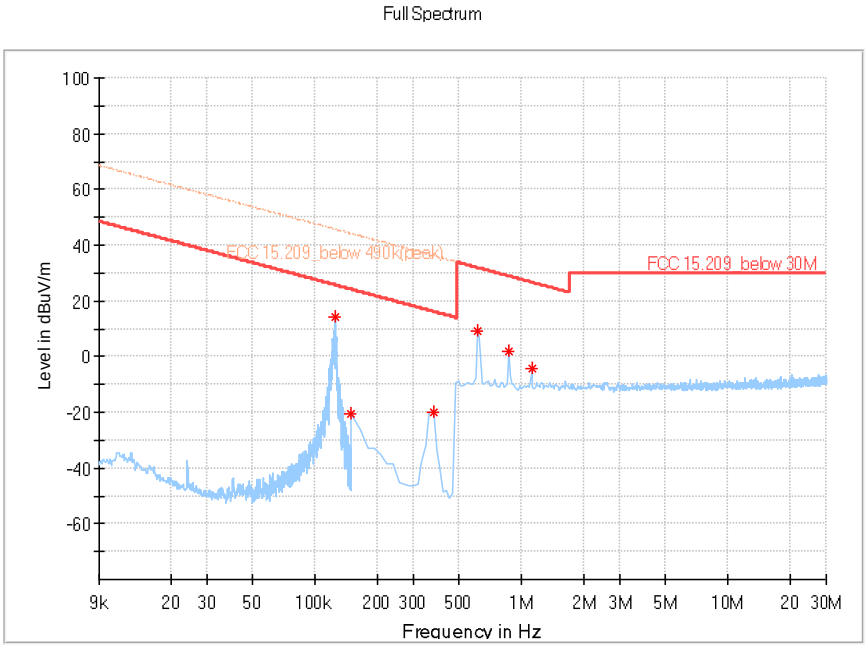
ANSI C63.10: 2013

RESULTS

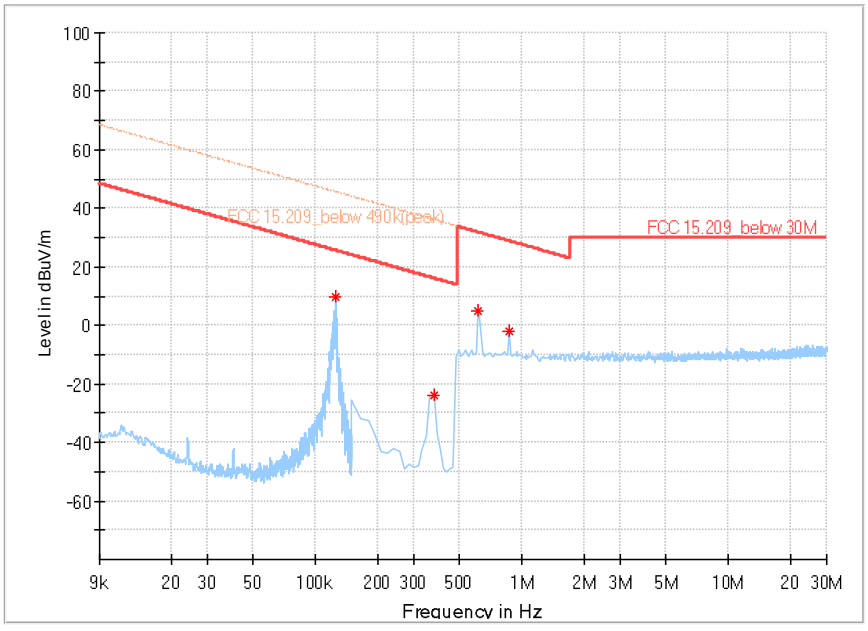
See the following pages.

RADIATED EMISSIONS FUNDAMENTAL & 9 KHz to 30 MHz

Face-On



Face-Off



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TEST DATA

[Face-On]

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.124620**	14.37	25.69	11.31	0.200	100.0	H	98.0	-59.6
0.150000	-20.70	24.08	44.78	9.000	100.0	H	89.0	-59.6
0.373875	-19.82	16.15	35.97	9.000	100.0	H	105.0	-59.7
0.612675	9.43	31.87	22.43	9.000	100.0	H	94.0	-19.6
0.866400	1.70	28.86	27.17	9.000	100.0	H	77.0	-19.6
1.120125	-4.52	26.64	31.16	9.000	100.0	H	246.0	-19.6

** Fundamental

[Face-Off]

Frequency (MHz)	MaxPeak (dBuV/m)	Limit (dBuV/m)	Margin (dB)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)
0.124542**	9.77	25.69	15.92	0.200	100.0	H	178.0	-59.6
0.373875	-23.93	16.15	40.08	9.000	100.0	H	0.0	-59.7
0.612675	5.15	31.87	26.72	9.000	100.0	H	0.0	-19.6
0.866400	-2.25	28.86	31.11	9.000	100.0	H	179.0	-19.6

** Fundamental

Note 1: Radiated test were investigated with three receiving antenna axes: Face-on, Face-off and horizontal (parallel to the ground plane) and the worse orientations of Face-on and Face-off were set for final test.

Note 2: Although these tests were performed other than open field test site, adequate comparison measurements were confirmed against 10m open field test site. Therefore, sufficient tests were made to demonstrate that the alternative site produces results that correlated with the one of tests made in an open field site based on KDB 414788.

7.3. AC MAINS LINE CONDUCTED EMISSIONS

TEST PROCEDURE

ANSI C63.10: 2013

The EUT is placed on a non-conducting table 40 cm from the vertical ground plane and 80 cm above the horizontal ground plane. The EUT is configured in accordance with ANSI C63.10.

The receiver is set to a resolution bandwidth of 9 kHz. Peak detection is used unless otherwise noted as quasi-peak or average.

Line conducted data is recorded for both NEUTRAL and HOT lines.

LIMIT

FCC §15.207 (a)

IC RSS-GEN Sections 8.8

Frequency range (MHz)	Limits (dBµV)	
	Quasi-peak	Average
0.15 to 0.50	66 to 56*	56 to 46*
0.50 to 5	56	46
5 to 30	60	50
*Decreases with the logarithm of the frequency.		

RESULTS (N/A)

This EUT is only supplied by vehicular battery.

END OF REPORT