FCC 47 CFR PART 15 SUBPART C
ISED CANADA RSS-Gen ISSUE 5
ISED CANADA RSS-210 ISSUE 9

125 kHz Transceiver

CERTIFICATION TEST REPORT

FOR

Key Locker

MODEL NUMBER : FT-KL1

FCC ID: VA5MCI500-LF125
IC: 7087A-MCI500LF125

REPORT NUMBER: 4789024027-E1V2

ISSUE DATE: JUL 12, 2019

Prepared for
SEGI LIMITED
Unit J2, 4/F, Block 1, Kinho Industrial Building,
14-24 Au Pui Wan Street, Shatin, New Territories
HONGKONG, China

Prepared by
UL Korea, Ltd.
26th floor, 152, Teheran-ro, Gangnam-gu Seoul, 06236, Korea

Suwon Test Site: UL Korea, Ltd. Suwon Laboratory
218 Maeyeong-ro, Yeongtong-gu,
Suwon-si, Gyeonggi-do, 16675, Korea
TEL: (031) 337-9902
FAX: (031) 213-5433

ACCREDITED
Testing Laboratory

TL-637

Revision History

Rev.	Issue Date	Revisions	Revised By
V1	07/11/19	Initial issue	Hoonpyo Lee
V2	07/12/19	Updated to address for TCB's question	Hoonpyo Lee

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

TABLE OF CONTENTS

1. ATTESTATION OF TEST RESULTS 4

2. TEST METHODOLOGY 5

3. FACILITIES AND ACCREDITATION 5

4. CALIBRATION AND UNCERTAINTY 5

4.1. MEASURING INSTRUMENT CALIBRATION 5

4.2. SAMPLE CALCULATION 5

4.3. MEASUREMENT UNCERTAINTY 6

5. EQUIPMENT UNDER TEST 7

5.1. DESCRIPTION OF EUT 7

5.2. MAXIMUM OUTPUT POWER 7

5.3. WORST-CASE CONFIGURATION 7

5.4. DESCRIPTION OF TEST SETUP 8

6. TEST AND MEASUREMENT EQUIPMENT 10

7. APPLICABLE LIMITS AND TEST RESULTS 11

7.1. 99% BANDWIDTH 11

7.2. RADIATED EMISSIONS 12

7.3. AC MAINS LINE CONDUCTED EMISSIONS 15

8. SETUP PHOTOS 16

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

1. ATTESTATION OF TEST RESULTS

COMPANY NAME: SEGI LIMITED

EUT DESCRIPTION: Key Locker

MODEL NUMBER: FT-KL1

SERIAL NUMBER: Proto-type

DATE TESTED: MAY 20, 2019 – JUL 12, 2019

APPLICABLE STANDARDS	
STANDARD	**TEST RESULTS**
CFR 47 Part 15 Subpart C ISED RSS-GEN ISSUE 5 ISED RSS-210 ISSUE 9	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:

Changyoung Choi
Suwon Lab Engineer
UL Korea, Ltd.

Tested By:

Hoonpyo 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-GEN, RSS-210.

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

IC test lab recognition no. : 2324M-1, 2324M-2, 2324M-3

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	2.32 dB
Radiated Disturbance, Below 1GHz	3.86 dB
Radiated Disturbance, Above 1 GHz	5.97 dB

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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

5. EQUIPMENT UNDER TEST

5.1. DESCRIPTION OF EUT

The EUT is a Key Locker with 125kHz.

5.2. MAXIMUM OUTPUT POWER

Fundamental Frequency (KHz)	Mode	E field (300m distance) FCC (dBuV/m)
125	Tx	13.55

5.3. WORST-CASE CONFIGURATION

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

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

5.4. DESCRIPTION OF TEST SETUP

SUPPORT EQUIPMENT & PERIPHERALS

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

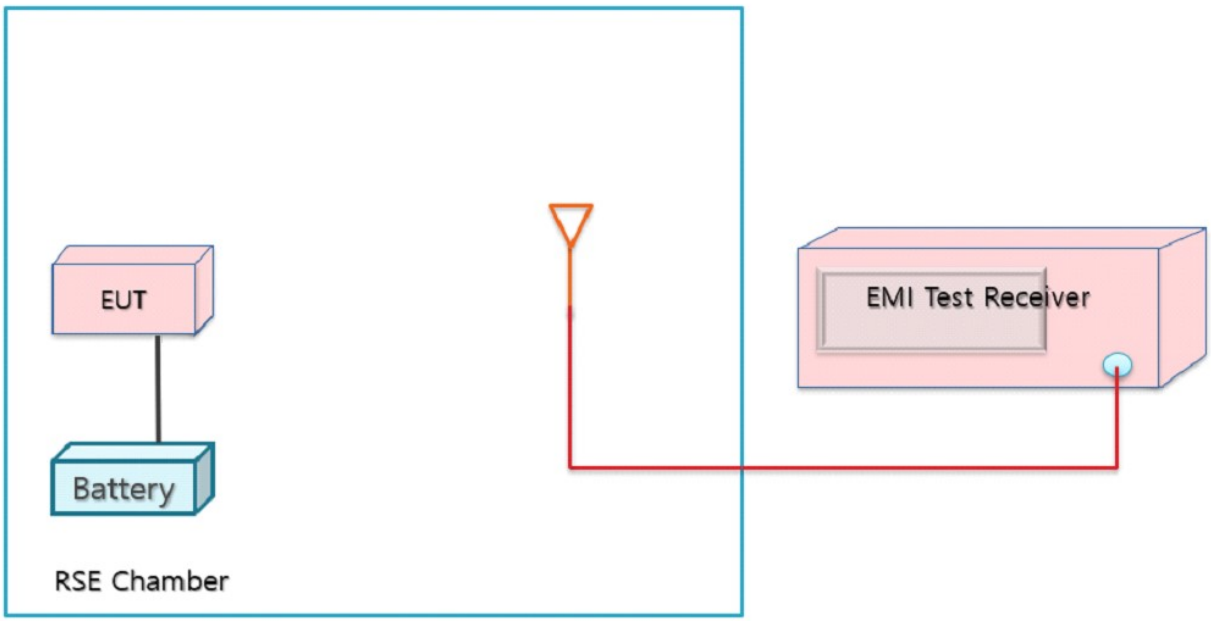
I/O CABLES

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

TEST SETUP

The EUT was tested in forced transmit mode using software.

TEST SETUP DIAGRAM



UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

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**
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	750	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	749	08-04-20
Antenna, Bilog, 30MHz-1GHz	SCHWARZBECK	VULB9163	845	08-04-20
Antenna, Loop, 9kHz-30MHz	R&S	HFH2-Z2	100418	10-26-19
Preamplifier, 1000 MHz	Sonoma	310N	341282	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
EMI Test Receive, 40 GHz	R&S	ESU40	100439	08-06-19
EMI Test Receive, 40 GHz	R&S	ESU40	100457	08-06-19
EMI Test Receive, 44 GHz	R&S	ESW44	101590	08-06-19
Spectrum Analyzer, 7 GHz	Agilent / HP	N9010A	MY54200580	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	351741	08-07-19
Preamplifier, 1000 MHz	Sonoma	310N	370599	08-07-19
UL Software				
Description	**Manufacturer**	**Model**	**Version**	
Radiated software	UL	UL EMC	Ver 9.5	

7. APPLICABLE LIMITS AND TEST RESULTS

7.1. 99% BANDWIDTH

LIMITS

None; for reporting purposes only.

TEST PROCEDURE

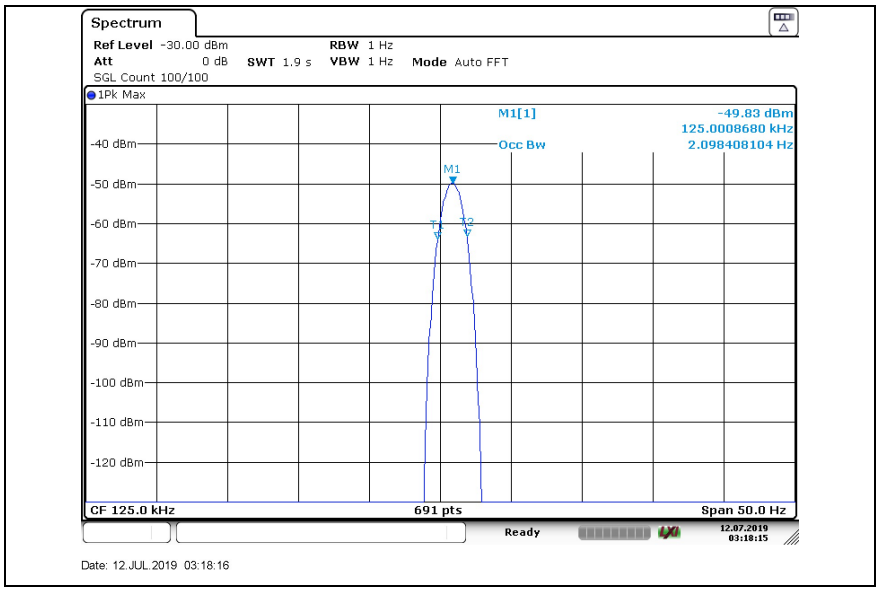
The transmitter output is connected to the spectrum analyzer. The RBW is set to 1% to 3% of the 99 % bandwidth and to 1% of the span. The VBW is set to >= 3 times the RBW.
The spectrum analyzer internal 99% bandwidth function is utilized.

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

RESULTS

Frequency [kHz]	99% Bandwidth [kHz]
125	0.0021

99% BANDWIDTH PLOTS



7.2. RADIATED EMISSIONS

TEST PROCEDURE

ANSI C63.10: 2013

LIMIT

FCC §15.209 (a)
IC RSS-GEN Sections 8.9 and 8.10.

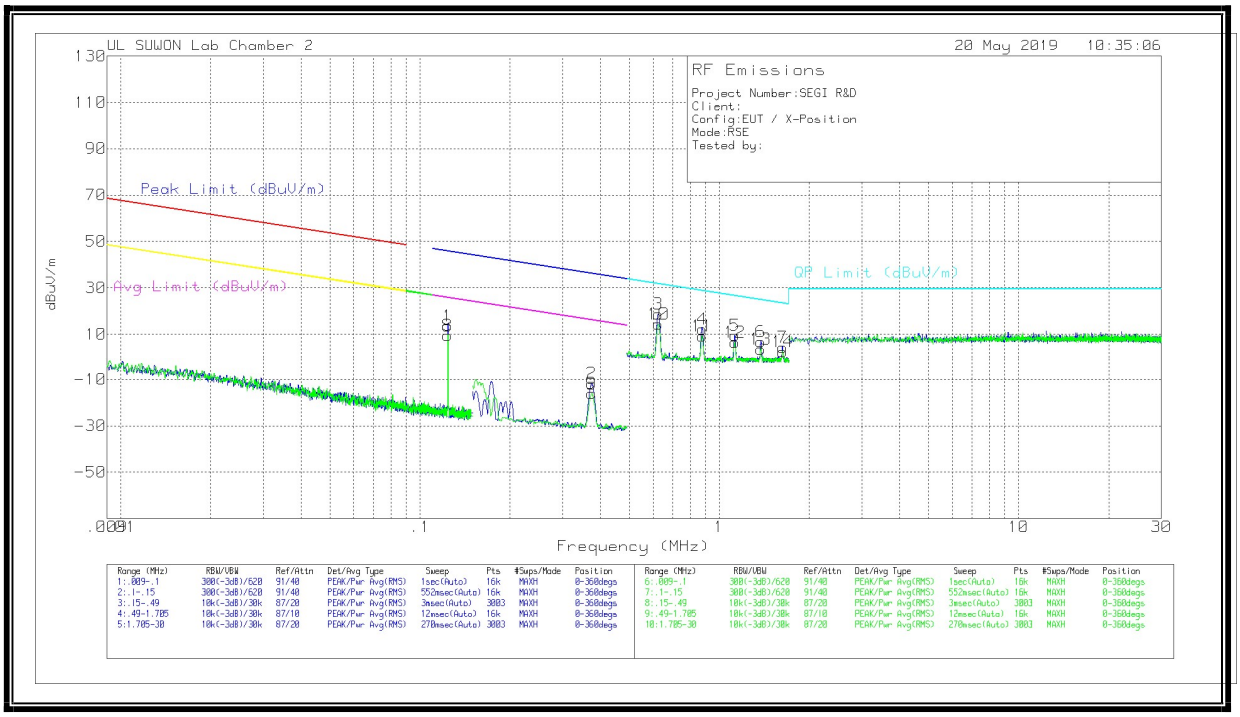
Frequency (MHz)	Field Strength (microvolts/meter)	Measurement Distance (m)
0.009–0.490	2400/F(kHz)	300
0.490–1.705	24000/F(kHz)	30
1.705–30.0	30	30
30–88	100	3
88 to 216	150	3
216 to 960	200	3
Above 960 MHz	500	3
Note: The lower limit shall apply at the transition frequency.		

RESULTS

See the following pages.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

RADIATED EMISSIONS FUNDAMENTAL & 9 KHz to 30 MHz



TEST DATA

Trace Markers

[Face-On]

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 300m	Corrected Reading dBuV/m	Peak Limit (dBuV/m)	Margin (dB)	Avg Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
1**	.1239	73.75	Pk	19.7	.1	-80	13.55	45.76	-32.21	25.76	-12.21	0-360
2	.37515	48.51	Pk	19.6	.1	-80	-11.79	36.12	-47.91	16.12	-27.91	0-360
8	.12395	69.79	Pk	19.7	.1	-80	9.59	45.76	-36.17	25.76	-16.17	0-360
9	.37504	44.36	Pk	19.6	.1	-80	-15.94	36.13	-52.07	16.13	-32.07	0-360

Marker	Frequency (MHz)	Meter Reading (dBuV)	Det	Loop Antenna	Cable Loss	Dist Corr 30m	Corrected Reading dBuV/m	QP Limit (dBuV/m)	Margin (dB)	Azimuth (Degs)
3	.62524	38.86	Pk	19.7	.1	-40	18.66	31.69	-13.03	0-360
4	.87851	32.4	Pk	19.7	.2	-40	12.3	28.74	-16.44	0-360
5	1.12635	29.55	Pk	19.7	.2	-40	9.45	26.59	-17.14	0-360
6	1.37449	26.78	Pk	19.7	.2	-40	6.68	24.87	-18.19	0-360
7	1.62871	24.52	Pk	19.7	.2	-40	4.42	23.4	-18.98	0-360
10	.62657	34.44	Pk	19.7	.1	-40	14.24	31.67	-17.43	0-360
11	.87684	29.23	Pk	19.7	.2	-40	9.13	28.76	-19.63	0-360
12	1.12566	26.5	Pk	19.7	.2	-40	6.4	26.6	-20.2	0-360
13	1.37266	23.49	Pk	19.7	.2	-40	3.39	24.88	-21.49	0-360
14	1.62761	22.54	Pk	19.7	.2	-40	2.44	23.4	-20.96	0-360

Pk - Peak detector

** Fundamental

Note 1: The radiated emissions was investigated at three receiving antenna axis Face-on, Face-off and horizontal (parallel to the ground plane). Only the data of the worst Face-on is described.

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.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433

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	Limits (dBµV)	
(MHz)	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.

UL Korea, Ltd. Suwon Laboratory FORM ID: FCC_15C
218 Maeyeong-ro, Yeongtong-gu, Suwon-si, Gyeonggi-do, 16675, Korea TEL: (031) 337-9902 FAX: (031) 213-5433