RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_RF_SL18092102-DIG-007_Rev1.0
Supersede Report No.: NONE

Applicant	Digital Security Controls, A Div. of TYCO Safety Products Canada Ltd.
Product Name	LTE Cellular Alarm Communicator
Model No.	LE7090
Test Standard	47CFR Part22, 47CFR Part24, 47CFR Part27 RSS-130, Issue 1 RSS-132, Issue 3 RSS133, Issue 6
Test Method	TIA-603-D: 2010 RSS Gen Issue 4, Nov 2014
FCC ID	F5318LE7090
IC	160A-LE7090
Date of test	10/20/2018-10/31/2018
Issue Date	11/20/2018
Test Result	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

George Hsu	Rachana Khanduri
Lead EMC Test Engineer	Engineering Reviewer

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Test result presented in this test report is applicable to the tested sample only

Issued By:
SIEMIC Laboratories
775 Montague Expressway, Milpitas, 95035 CA

ilac-MRA
A2LA ACCREDITED
TESTING CERT # 2742-01

Laboratory Introduction

SIEMIC, headquartered in the heart of Silicon Valley, with superior facilities in US and Asia, is one of the leading independent testing and certification facilities providing customers with one-stop shop services for Compliance Testing and Global Certifications.

In addition to testing and certification, SIEMIC provides initial design reviews and compliance management throughout a project. Our extensive experience with China, Asia Pacific, North America, European, and International compliance requirements, assures the fastest, most cost effective way to attain regulatory compliance for the global markets.

Accreditations for Conformity Assessment

Country/Region	Accreditation Body	Scope
USA	FCC, A2LA	EMC, RF/Wireless, Telecom
Canada	IC, A2LA, NIST	EMC, RF/Wireless, Telecom
Taiwan	BSMI, NCC, NIST	EMC, RF, Telecom, Safety
Hong Kong	OFTA, NIST	RF/Wireless, Telecom
Australia	NATA, NIST	EMC, RF, Telecom, Safety
Korea	KCC/RRA, NIST	EMI, EMS, RF, Telecom, Safety
Japan	VCCI, JATE, TELEC, RFT	EMI, RF/Wireless, Telecom
Mexico	NOM, COFETEL, Caniety	Safety, EMC, RF/Wireless, Telecom
Europe	A2LA, NIST	EMC, RF, Telecom, Safety
Israel	MOC, NIST	EMC, RF, Telecom, Safety

Accreditations for Product Certifications

Country	Accreditation Body	Scope
USA	FCC TCB, NIST	EMC, RF, Telecom
Canada	IC FCB, NIST	EMC, RF, Telecom
Singapore	iDA, NIST	EMC, RF, Telecom
EU	NB	EMC & Radio Equipment Directive (RED)
Japan	MIC (RCB 208)	RF, Telecom
HongKong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL18092102-DIG-007	None	Original	11/16/2018
FCC_IC_RF_SL18092102-DIG-007_Rev1.0	Rev1.0	Updated FCC and IC ID	11/20/2018

2 Executive Summary

The purpose of this test program was to demonstrate compliance of following product

Company: Digital Security Controls, A Div. of TYCO Safety Products Canada Ltd.
Product: LTE Cellular Alarm Communicator
Model: LE7090

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Digital Security Controls, A Div. of TYCO Safety Products Canada Ltd.
Applicant Address	3301 Langstaff Rd., Concord, ON L4k4L2 Canada
Manufacturer Name	Digital Security Controls, A Div. of TYCO Safety Products Canada Ltd.
Manufacturer Address	3301 Langstaff Rd., Concord, ON L4k4L2 Canada

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	881796
IC Test Site No.	4842D-2
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Product Name	LTE Cellular Alarm Communicator
Model No.	LE7090
Trade Name	Tyco - Digital Security Controls
Serial No.	N/A
EUT Input Power	3.8VDC/400mA
Power Adapter Manu/Model	N/A
Date of EUT received	10/15/2018
Hardware Version	N/A
Software Version	ver. 1.0
Equipment Class/ Category	PCB, TNB
Operating Frequencies	LTE TX: 1850 MHz to 1910 MHz, RX: 1930 MHz to 1990 MHz TX: 1710 MHz to 1755 MHz, RX: 2110 MHz to 2155 MHz TX: 824 MHz to 849 MHz, RX: 869 MHz to 894 MHz TX: 699 MHz to 716 MHz, RX: 729 MHz to 746 MHz TX: 777 MHz to 787 MHz, RX: 746 MHz to 756 MHz
Port/Connectors	N/A
Remark	NONE

6.2 Radio Description

Item	LTE	LTE	LTE
Operating Band /Radio Type	LTE Band 2	LTE Band 4	LTE Band 5
Bandwidth	5MHz, 10MHz, 15MHz, 20MHz	5MHz, 10MHz, 15MHz, 20MHz	5MHz, 10MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	Coupled Monopoles	Coupled Monopoles	Coupled Monopoles
Antenna Gain	3.1 dBi	3 dBi	-1.2 dBi
Frequency TX(MHz)	TX: 1850 MHz to 1910 MHz RX: 1930 MHz to 1990 MHz	TX: 1710 MHz to 1755 MHz RX: 2110 MHz to 2155 MHz	TX: 824 MHz to 849 MHz RX: 869 MHz to 894 MHz

Item	LTE	LTE
Operating Band /Radio Type	LTE Band 12	LTE Band 13
Bandwidth	5MHz, 10MHz	5MHz, 10MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	Coupled Monopoles	Coupled Monopoles
Antenna Gain	1.5 dBi	0 dBi
Frequency TX(MHz)	TX: 699 MHz to 716 MHz RX: 729 MHz to 746 MHz	TX: 777 MHz to 787 MHz RX: 746 MHz to 756 MHz

6.3 EUT test modes/configuration Description

Test mode

Final Test Mode		Note
Final_test_mode_1	Continuous transmission, single channel	LTE
Remark: LTE band 2,4,5,12,13 and UMTS band 2, 5 are evaluated.		

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
-	-	-	-	-	-

7.1 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
-	-	-	-	-	-	-	-

7.2 Test Software Description

Test Item	Software	Description
N/A	N/A	N/A

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
E.R.P/ E.I.R.P.	FCC	47CFR24.232, 47CFR27.50	FCC	TIA-603-D: 2010	☒ Pass * ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Occupied Bandwidth	FCC	47CFR24.238(a), 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass * ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Peak-Average Ratio	FCC	47CFR24.232, 47CFR27.50	FCC	TIA-603-D: 2010	☒ Pass * ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Spurious and harmonic Emission at antenna port	FCC	47CFR2.1051,47CFR24.238, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Band Edge	FCC	47CFR2.1053,47CFR24.238, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass * ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Radiated spurious and harmonic emission	FCC	47CFR2.1053,47CFR24.238, 47CFR27.53	FCC	TIA-603-D: 2010	☒ Pass ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Frequency stability	FCC	47CFR2.1055, 47CFR24.135, 47CFR27.54	FCC	TIA-603-D: 2010	☒ Pass * ☐ N/A
	IC	RSS-130, RSS-132, RSS-133	IC	RSS Gen Issue 4: 2014	
Remark	1. All measurement uncertainties do not take into consideration for all presented test results. 2. The applicant shall ensure frequency stability by showing that an emission is maintained within the band of operation under all normal operating conditions as specified in the user's manual. 3. Pass* Please refer to 1506FR22-01 and 1506FR21-01 RF test reports for test items.				

9 Measurement Uncertainty

9.1 Radiated Emissions (30MHz to 1GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:
- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- NSA Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Filter Insertion Loss	0.25	Normal	2	1	0.125
Antenna Factor	0.65	Normal	2	1	0.325
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.86605081
PRF Response	1.5	Rectangular	1.732	1	0.86605081
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
NSA Calibration	4.0	U-Shape	1.414	1	2.8288543
Combined Standard Uncertainty					3.0059131
Expanded Uncertainty (K=2)					**6.0118262**

The total derived measurement uncertainty is +/- 6.00 dB.

9.2 Radiated Emissions (1GHz to 40GHz)

The test is to measure the radiated emissions of the EUT.

Some error sources that can contribute to the total uncertainty:
- Uncertainty of the receiver
- Uncertainty of the antenna
- Uncertainty of cables
- Uncertainty due to the mismatches
- VSWR Calibration
- Etc., details see the below table

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Receiver Reading	0.12	Rectangular	1.732	1	0.0692840
Cable Insertion Loss	0.21	Normal	2	1	0.1050000
Filter Insertion Loss	0.25	Normal	2	1	0.1250000
Antenna Factor	0.65	Normal	2	1	0.3250000
Receiver CW accuracy	0.5	Rectangular	1.732	1	0.2886836
Pulse Amplitude Response	1.5	Rectangular	1.732	1	0.8660508
PRF Response	1.5	Rectangular	1.732	1	0.8660508
Mismatch Filter - Receiver	0.25	U-Shape	1.414	1	0.1768033
VSWR Calibration	2.0	U-Shape	1.414	1	1.4144272
Combined Standard Uncertainty					4.2363
Expanded Uncertainty (K=2)					**8.4726**

The total derived measurement uncertainty is +/- 8.47 dB.

9.3 RF conducted measurement

The test is to measure the RF output power from the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the Reference Level Uncertainty
- Uncertainty of variable attenuators
- Uncertainty of cables
- Uncertainty due to the mismatches

Source of Uncertainty	Value (dB)	Probability Distribution	Division	Sensitivity Coefficient	Expanded Uncertainty
Reference Level	0.12	Rectangular	1.732	1	0.069284
Cable Insertion Loss	0.21	Normal	2	1	0.105
Attenuator	0.25	Normal	2	1	0.125
Mismatch	0.25	U-Shape	1.414	1	0.1768033
Combined Standard Uncertainty					0.476087
Expanded Uncertainty (K=2)					**0.952174**

The total derived measurement uncertainty is +/- 0.95 dB.

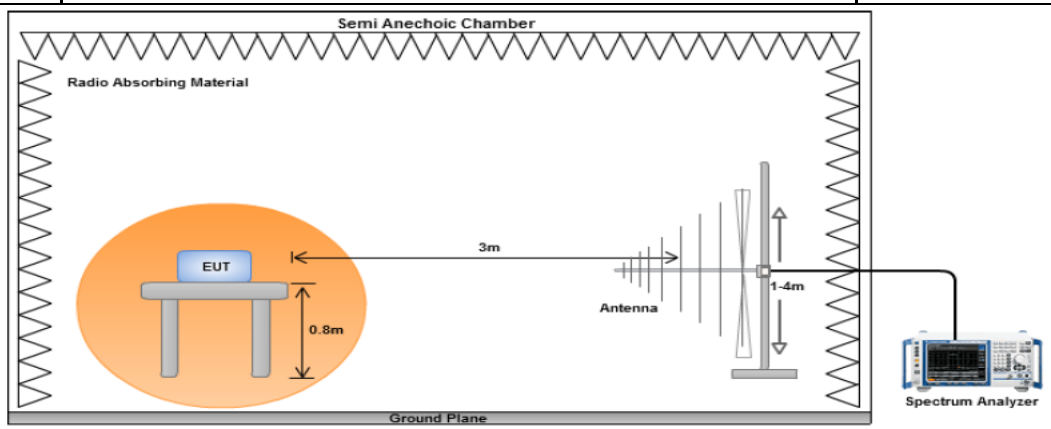
10 Measurements, Examination and Derived Results

10.1 Radiated Spurious Emission below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.53 RSS-130, RSS-132, RSS-133	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒
47CFR24.238 RSS-130, RSS-132, RSS-133	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒

Test Setup



Test Procedure

Substitution method:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The center of the substitution antenna should be approximately at the same location as the center of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a nonradiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.

Test Date	10/20/2018-10/31/2018	Environmental condition	Temperature	24°C
			Relative Humidity	42%
			Atmospheric Pressure	1012mbar

Remark

Limit calculation:
Emission limit = PdBm – [43+ 10 log (PW)] = 10log(1000 x PW) - 43 - 10log(PW) = 30 dBm - 43 = -13 dBm
All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth was presented in this report.

Result ☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by George Hsu at *10m chamber*.

Radiated Emission Test Results for LTE

Test specification	Below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	24		
	Humidity (%)	42		
	Atmospheric (mbar):	1012		
Mains Power:	120Vac, 60Hz			
Tested by:	George Hsu			
Test Date:	10/20/2018-10/31/2018			
Remarks:	LTE Band 2,4,5,12 and 13.			

LTE Band2-Mid CH-20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
332.52	-79.50	119	331	V	332.52	-15.8	0	2.47	-18.27	-13	-5.27
332.52	-79.65	88	101	H	332.52	-15.35	0	2.47	-17.82	-13	-4.82
458.31	-79.61	259	209	V	458.31	-15.74	0	2.51	-18.25	-13	-5.25
458.31	-79.77	196	123	H	458.31	-15.4	0	2.51	-17.91	-13	-4.91

LTE Band4-Mid CH-20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
198.24	-68.85	62	182	H	198.24	-22.75	0	2.27	-25.02	-13	-12.02
199.29	-66.60	147	152	V	199.29	-28.40	0	2.27	-30.67	-13	-17.67
406.80	-79.09	105	175	H	406.80	-17.08	0	2.56	-19.64	-13	-6.64
406.80	-78.80	134	202	V	406.80	-15.79	0	2.56	-18.35	-13	-5.35

LTE Band5-Mid CH-10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
202.50	-67.95	76	172	V	202.50	-20.85	0	1.89	-22.74	-13	-9.74
203.50	-66.80	125	132	H	203.50	-21.40	0	1.89	-23.29	-13	-10.29
406.80	-80.13	98	145	V	406.80	-14.93	0	2.48	-17.405	-13	-4.40
406.80	-81.33	125	178	H	406.80	-15.93	0	2.48	-18.405	-13	-5.40

LTE Band12-Mid CH-10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
202.42	-68.33	133	208	V	202.42	-22.13	0	1.95	-24.08	-13	-11.08
202.64	-70.3	241	143	H	202.64	-22.1	0	1.95	-24.05	-13	-11.05
564.54	-80.5	276	129	V	564.54	-17.3	0	2.54	-19.844	-13	-6.84
564.50	-82.8	342	219	H	564.50	-17.6	0	2.54	-20.144	-13	-7.14

LTE Band13-Mid CH-10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
199.29	-67.75	18	155	V	199.29	-22.65	0	2.09	-24.743	-13	-11.74
198.24	-65.4	287	170	H	198.24	-28.2	0	2.09	-30.293	-13	-17.29
473.84	-79.93	203	189	V	473.84	-16.66	0	2.52	-19.181	-13	-6.18
475.50	-80.1	315	154	H	475.50	-16.63	0	2.52	-19.151	-13	-6.15

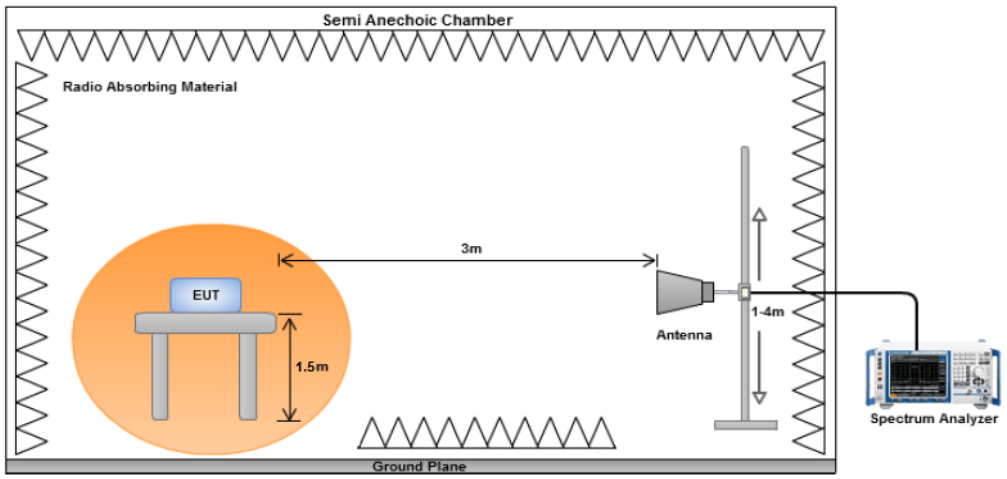
Note: Dipole antenna was used for substitution method.

10.2 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR27.53 RSS-130, RSS-132, RSS-133	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒
47CFR24.238 RSS-130, RSS-132, RSS-133	-	Out of band emissions. The power of any emission outside of the authorized operating frequency ranges must be attenuated below the transmitting power (P) by a factor of at least 43 + 10 log(P) dB.	☒

Test Setup



Test Procedure

Substitution method:

1. The EUT was switched on and allowed to warm up to its normal operating condition.
2. The test was carried out at the selected frequency points obtained from the EUT characterisation. Maximization of the emissions, was carried out by rotating the EUT, changing the antenna polarization, and adjusting the antenna height in the following manner:
   a. Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen.
   b. The EUT was then rotated to the direction that gave the maximum emission.
   c. Finally, the antenna height was adjusted to the height that gave the maximum emission.
3. Remove the transmitter and replace it with a substitution antenna (the antenna should be half-wavelength for each frequency involved). The centre of the substitution antenna should be approximately at the same location as the centre of the transmitter.
4. Feed the substitution antenna at the transmitter end with a signal generator connected to the antenna by means of a non-radiating cable. With the antennas at both ends horizontally polarized, and with the signal generator tuned to a particular spurious frequency, raise and lower the test antenna to obtain a maximum reading at the spectrum analyzer. Adjust the level of the signal generator output until the previously recorded maximum reading for this set of conditions is obtained.
5. Steps 4 were repeated for the next frequency point, until all selected frequency points were measured.

Test Date	10/20/2018-10/31/2018	Environmental condition	Temperature	23°C
			Relative Humidity	48%
			Atmospheric Pressure	1008mbar

Remark

The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.
Limit calculation:
Emission limit = P dBm – [43+ 10 log (PW)] = 10log (1000 x PW) - 43 - 10log(PW) = 30 dBm - 43 = -13 dBm
All different modulation and bandwidth configuration has been verified and only the test data of worst case with QPSK modulation and greatest bandwidth was presented in this report.

Result ☒ Pass ☐ Fail

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by *George Hsu* at *10m chamber*.

Radiated Emission Test Results (Above 1GHz)

LTE Band 2 Low Channel, 20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
3697.87	-55.14	45	113	H	3697.87	-34.39	7.9	2.60	-29.09	-13	-16.09
3700.37	-55.93	76	100	V	3700.37	-35.38	7.9	2.60	-30.08	-13	-17.08
5549.45	-57.16	45	101	H	5549.45	-35.16	9.7	1.90	-27.36	-13	-14.36
5550.45	-55.61	98	145	V	5550.45	-35.11	9.7	1.90	-27.31	-13	-14.31

LTE Band 2 Mid Channel, 20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
3756.87	-55.21	98	159	H	3756.87	-31.31	8	2.63	-25.94	-13	-12.94
3757.30	-55.49	238	118	V	3757.30	-31.29	8	2.63	-25.92	-13	-12.92
5639.79	-56.94	127	131	H	5639.79	-36.24	9.8	1.87	-28.31	-13	-15.31
5640.42	-56.82	265	200	V	5640.42	-36.22	9.8	1.87	-28.29	-13	-15.29

LTE Band 2 High Channel, 20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
3824.31	-49.69	56	186	H	3824.31	-31.39	8	2.08	-25.47	-13	-12.47
3824.75	-56.30	45	133	V	3824.75	-31.40	8	2.08	-25.48	-13	-12.48
5792.58	-56.30	87	133	H	5792.58	-27.30	9.8	1.80	-19.30	-13	-6.30
5791.28	-55.70	76	100	V	5791.28	-27.30	9.8	1.80	-19.30	-13	-6.30

LTE Band 4 Low Channel, 20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
3421.74	-55.27	167	230	H	3421.74	-32.67	7.7	2.54	-27.51	-13	-14.51
3421.81	-55.42	139	122	V	3421.81	-32.52	7.7	2.54	-27.36	-13	-14.36
5129.86	-56.96	288	147	H	5129.86	-30.86	8.936	2.30	-24.22	-13	-11.22
5131.85	-56.07	345	158	V	5131.85	-30.87	8.936	2.30	-24.23	-13	-11.23

LTE Band 4 Mid Channel, 20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
3464.82	-51.14	43	187	H	3464.82	-24.84	7.828	2.65	-19.66	-13	-6.66
3467.22	-51.52	56	191	V	3467.22	-24.82	7.828	2.65	-19.64	-13	-6.64
5197.11	-55.84	67	183	H	5197.11	-30.04	8.8	2.24	-23.48	-13	-10.48
5195.59	-55.87	87	118	V	5195.59	-30.07	8.8	2.24	-23.51	-13	-10.51

LTE Band 4 High Channel, 20MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
3509.55	-45.48	45	159	H	3509.55	-25.78	7.9	2.48	-20.36	-13	-7.36
3510.61	-54.53	87	115	V	3510.61	-27.83	7.9	2.48	-22.41	-13	-9.41
5266.32	-56.53	87	114	H	5266.32	-25.23	8.7	2.17	-18.70	-13	-5.70
5266.25	-56.39	70	124	V	5266.25	-25.29	8.7	2.17	-18.76	-13	-5.76

LTE Band 5 Low Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1658.34	-53.88	120	162	H	1658.34	-28.78	5.07	1.78	-25.50	-13	-12.50
1658.34	-51.80	112	142	V	1658.34	-28.80	5.07	1.78	-25.52	-13	-12.52
2487.41	-56.60	212	122	H	2487.41	-25.90	5.30	2.24	-22.84	-13	-9.84
2487.41	-55.80	156	132	V	2487.41	-25.10	5.30	2.24	-22.04	-13	-9.03

LTE Band 5 Mid Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1662.32	-54.88	123	176	H	1662.32	-28.88	5.00	1.79	-25.67	-13	-12.67
1672.22	-57.58	154	164	V	1672.22	-28.88	5.00	1.79	-25.67	-13	-12.67
2512.12	-58.80	212	185	H	2512.12	-25.10	5.32	2.24	-22.02	-13	-9.02
2510.24	-57.90	232	122	V	2510.24	-25.90	5.32	2.24	-22.82	-13	-9.82

LTE Band 5 High Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1699.23	-54.88	342	130	H	1699.23	-28.88	4.95	1.81	-25.74	-13	-12.74
1695.38	-57.22	286	218	V	1695.38	-28.82	4.95	1.81	-25.68	-13	-12.68
2551.31	-56.80	180	197	H	2551.31	-25.10	5.36	2.24	-21.98	-13	-8.98
2550.29	-57.80	38	145	V	2550.29	-25.90	5.36	2.24	-22.78	-13	-9.78

LTE Band 12 Low Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1392.42	-51.90	142	192	H	1392.42	-30.12	4.88	1.70	-26.94	-13	-13.94
1391.25	-55.80	112	142	V	1391.25	-30.99	4.88	1.70	-27.81	-13	-14.81
2094.25	-57.10	132	131	H	2094.25	-26.79	4.70	2.09	-24.18	-13	-11.18
2099.13	-56.90	123	121	V	2099.13	-24.40	4.70	2.09	-21.79	-13	-8.79

LTE Band 12 Mid Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1412.27	-54.68	156	192	H	1412.27	-32.90	4.92	1.74	-29.72	-13	-16.72
1421.22	-56.80	146	142	V	1421.22	-31.99	4.92	1.74	-28.81	-13	-15.81
2127.45	-58.90	53	212	H	2127.45	-26.40	4.70	2.10	-23.80	-13	-10.80
2119.24	-57.50	216	111	V	2119.24	-27.19	4.70	2.10	-24.59	-13	-11.59

LTE Band 12 High Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1442.21	-54.88	145	182	H	1442.21	-32.98	4.984	1.73	-29.73	-13	-16.73
1423.52	-57.90	121	121	V	1423.52	-32.00	4.984	1.73	-28.75	-13	-15.75
2152.20	-56.80	192	198	H	2152.20	-26.40	4.70	2.10	-23.80	-13	-10.80
2132.20	-57.90	120	203	V	2132.20	-27.20	4.70	2.10	-24.60	-13	-11.60

LTE Band 13 Low Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1551.84	-53.95	33	199	H	1551.84	-32.45	5.36	1.71	-28.80	-13	-15.80
1568.63	-54.57	256	171	V	1568.63	-31.47	5.36	1.71	-27.82	-13	-14.82
2327.52	-51.82	25	197	H	2327.52	-26.72	5.16	2.18	-23.74	-13	-10.74
2352.42	-55.03	45	189	V	2352.42	-25.93	5.16	2.18	-22.95	-13	-9.95

LTE Band 13 Mid Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1572.24	-54.88	116	183	H	1572.24	-32.48	5.344	1.71	-28.85	-13	-15.85
1569.42	-65.77	263	152	V	1569.42	-31.57	5.344	1.71	-27.94	-13	-14.94
2346.43	-62.79	309	201	H	2346.43	-26.69	5.17	2.18	-23.70	-13	-10.70
2348.65	-66.40	111	142	V	2348.65	-25.90	5.17	2.18	-22.91	-13	-9.91

LTE Band 13 High Channel, 10MHz BW, QPSK

Indicated			Test Antenna		Substituted						
Frequency (MHz)	Raw (dBm)	Degree	Height (cm)	Polarity	Frequency (MHz)	Level (dBm)	Ant Gain (dBi)	Cable Loss (dB)	Absolute Level (dBm)	Limit (dBm)	Margin (dB)
1571.78	-55.00	30	196	H	1571.78	-32.40	5.32	1.17	-28.25	-13	-15.25
1573.98	-65.79	24	169	V	1573.98	-31.49	5.32	1.17	-27.34	-13	-14.34
2360.23	-60.79	54	200	H	2360.23	-26.69	5.2	2.18	-23.67	-13	-10.67
2363.25	-66.88	58	181	V	2363.25	-25.98	5.2	2.18	-22.96	-13	-9.96

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
Keysight EXA 44GHz Spectrum Analyzer	N9010A	MY51440112	11/08/2017	1 Year	11/08/2018	☑
R & S Wideband Communication Tester	CMW500	108852	11/03/2017	1 Year	11/03/2018	☑
Pre-Amp (30MHz~40GHz)	LPA-6-30	11140711	02/10/2018	1 Year	02/10/2019	☑
Preamplifier (100KHz-7GHz)	LPA-6-30	11170602	06/09/2018	1 Year	06/09/2019	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	03/09/2018	2 Year	03/09/2020	☑
Horn Antenna (1GHz~26GHz)	3115	100059	01/26/2018	2 Year	01/26/2020	☑
Horn Antenna (1-18GHz)	3117	218554	11/22/2018	1 Year	11/22/2019	☑
Tuned Dipole Antenna 30 - 1000 MHz (4pcs set)	AD-100	40133	01/23/2018	1 Year	01/23/2020	☑

Annex B. SIEMIC Accreditation

Accreditations	Document	Scope / Remark
ISO 17025 (A2LA)		Please see the documents for the detailed scope
ISO Guide 65 (A2LA)		Please see the documents for the detailed scope
TCB Designation		A1, A2, A3, A4, B1, B2, B3, B4, C
FCC DoC Accreditation		FCC Declaration of Conformity Accreditation
FCC Site Registration		3-meter site
FCC Site Registration		10-meter site
IC Site Registration		3-meter site
IC Site Registration		10-meter site
EU NB		**Radio Equipment: EN45011:** EN ISO/IEC 17065
		Electromagnetic Compatibility: EN45011 – EN ISO/IEC 17065
Singapore iDA CB (Certification Body)		Phase I, Phase II
Vietnam MIC CAB Accreditation		Please see the document for the detailed scope
Hong Kong OFCA		**(Phase II)** OFCA Foreign Certification Body for Radio and Telecom
		(Phase I) Conformity Assessment Body for Radio and Telecom
Industry Canada CAB		**Radio:** Scope A – All Radio Standard Specification in Category I
		Telecom: CS-03 Part I, II, V, VI, VII, VIII

Japan Recognized Certification Body Designation		**Radio**: A1. Terminal equipment for purpose of calling **Telecom**: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law
Korea CAB Accreditation		**EMI:** KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI **EMS:** KCC Notice 2008-38, RRL Notice 2008-4: CA Procedures for EMS KN24, KN61000-4-2, -4-3, -4-4, -4-5, -4-6, -4-8, -4-11: Test Method for EMS
		Radio: RRL Notice 2008-26, RRL Notice 2008-2, RRL Notice 2008-10, RRL Notice 2007-49, RRL Notice 2007-20, RRL Notice 2007-21, RRL Notice 2007-80, RRL Notice 2004-68
		Telecom: President Notice 20664, RRL Notice 2007-30, RRL Notice 2008-7 with attachments 1, 3, 5, 6; President Notice 20664, RRL Notice 2008-7 with attachment 4
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		R-3083: Radiation 3-meter site C-3421: Main Ports Conducted Interference Measurement T-1597: Telecommunication Ports Conducted Interference Measurement
Australia CAB Recognition		**EMC:** AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4
		Radiocommunications: AS/NZS 4281, AS/NZS 4268, AS/NZS 4280.1, AS/NZS 4280.2, AS/NZS 4295, AS/NZS 4582, AS/NZS 4583, AS/NZS 4769.1, AS/NZS 4769.2, AS/NZS 4770, AS/NZS 4771
		Telecommunications: AS/ACIF S002:05, AS/ACIF S003:06, AS/ACIF S004:06 AS/ACIF S006:01, AS/ACIF S016:01, AS/ACIF S031:01, AS/ACIF S038:01, AS/ACIF S040:01, AS/ACIF S041:05, AS/ACIF S043.2:06, AS/ACIF S60950.1
Australia NATA Recognition		AS/ACIF S002, AS/ACIF S003, AS/ACIF S004, AS/ACIF S006, AS/ACIF S016, AS/ACIF S031, AS/ACIF S038, AS/ACIF S040, AS/ACIF S041, AS/ACIF S043.2