RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC_IC_RF_SL17102301-DIG-002_LE4010
Supersede Report No.:

Applicant	Digital Security Controls, A Div. of TYCO Safety Products Canada Ltd.
Product Name	Cellular Alarm Communicator
Model No.	LE4010
Test Standard	47CFR Part22, 47CFR Part27, 47CFR Part24 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	F5317LE4010
IC ID	160-LE4010
Date of test	12/03/2017-12/04/2017
Issue Date	12/05/2017
Test Result	Pass Fail
Equipment complied with the specification	[x]
Equipment did not comply with the specification	[ ]

Rachana Khanduri	Chen Ge
Test Engineer	Engineering Reviewer

This test report may be reproduced in full only
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_SL17102301-DIG-002_LE4010	None	Original	12/05/2017

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: Cellular Alarm Communicator
Model: LE4010

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	Cellular Alarm Communicator
Model No.	LE4010
Trade Name	DSC
Serial No.	73-02388
Input Power	100-240VAC,50/60Hz
Power Adapter Manu/Model	HK-XX14-A138NAC
Date of EUT received	11/27/2017
Hardware Version	UA673 Rev. 03
Software Version	SW Ver. 5.0
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 UMTS TX: 1850 MHz to 1910 MHz, RX: 1930 MHz to 1990 MHz TX: 824 MHz to 849 MHz, RX: 869 MHz to 894 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, 15MHz, 20MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	Whip Antenna	Whip Antenna	Whip Antenna
Antenna Gain	3.2 dBi	3.2 dBi	4.4 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, 15MHz, 20MHz	5MHz, 10MHz, 15MHz, 20MHz
Modulation	QPSK/16QAM/64QAM	QPSK/16QAM/64QAM
Antenna Type	Whip Antenna	Whip Antenna
Antenna Gain	4.4 dBi	4.4 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

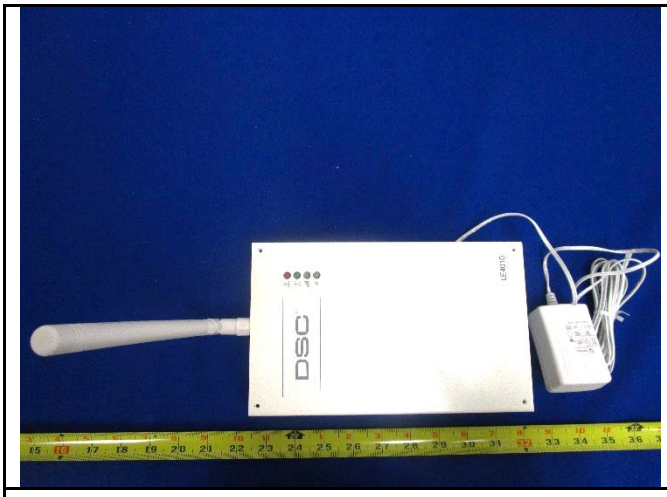
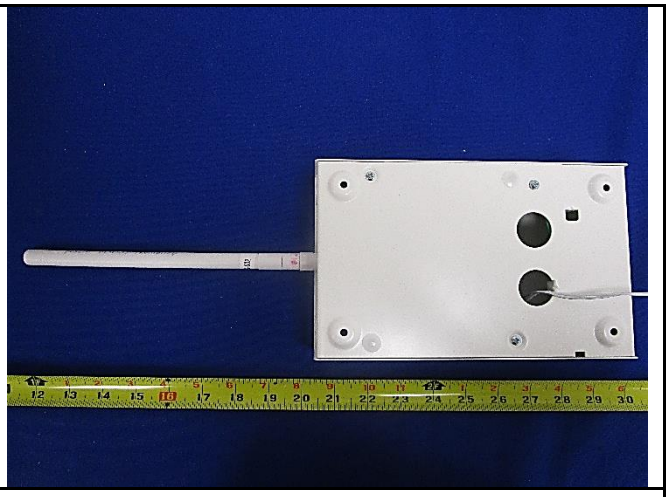
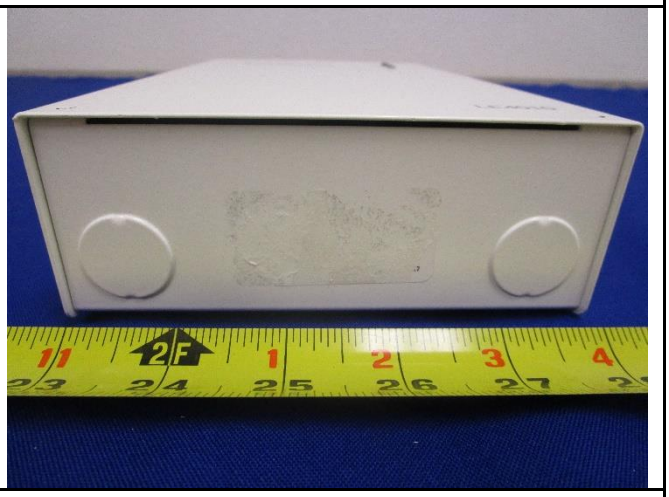
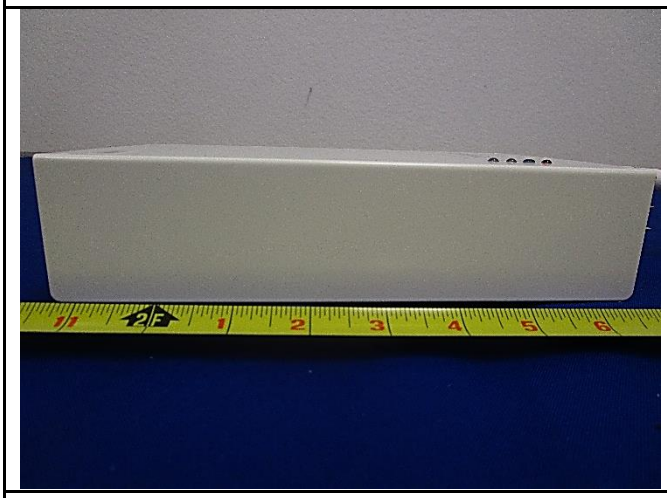
Item	UMTS	UMTS
Operating Band /Radio Type	UMTS Band 2	UMTS Band 5
Bandwidth	3.84MHz	3.84MHz
Modulation	QPSK	QPSK
Antenna Type	Whip Antenna	Whip Antenna
Antenna Gain	3.2 dBi	4.4 dBi
Frequency TX(MHz)	TX: 1850 MHz to 1910 MHz RX: 1930 MHz to 1990 MHz	TX: 824 MHz to 849 MHz RX: 869 MHz to 894 MHz

6.3 EUT test modes/configuration Description

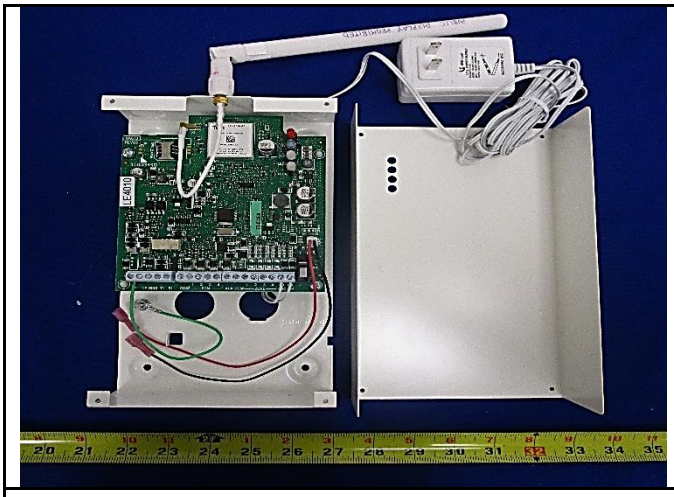
Test mode

Final Test Mode		Note
Final_test_mode_1	Continuous transmission, single channel	LTE
Final_test_mode_2	Continuous transmission, single channel	UMTS
Remark: LTE band 2,4,5,12,13 and UMTS band 2, 5 are evaluated.		

6.4 EUT Photos - External

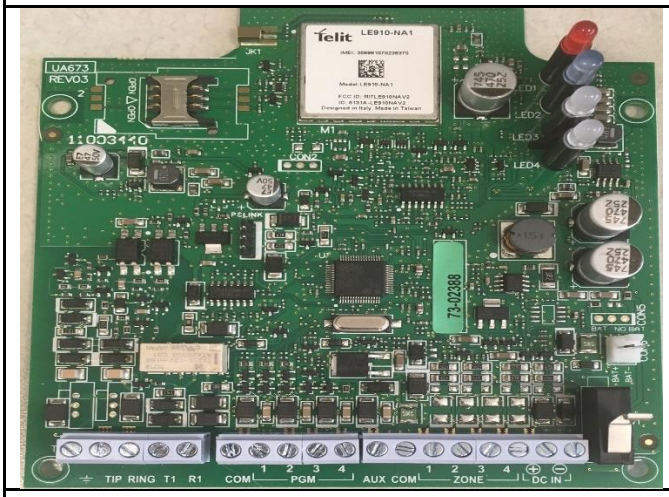
	
Top View	**Bottom View**
	
Front View	**Rear View**
	
Left Side View	**Right Side View**

6.5 EUT Photos – Internal

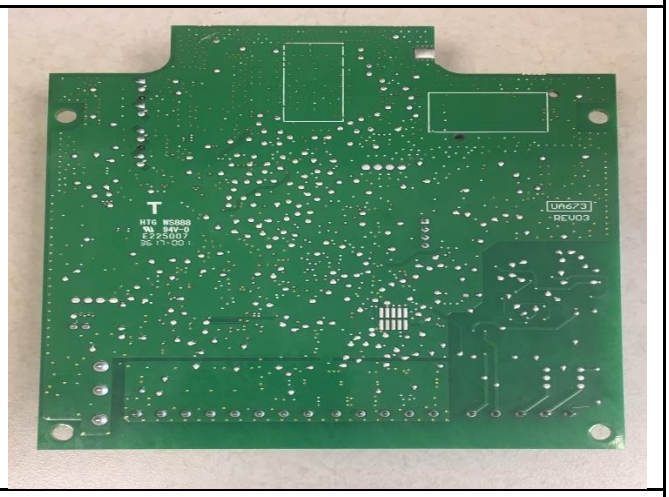


EUT - Open Case View

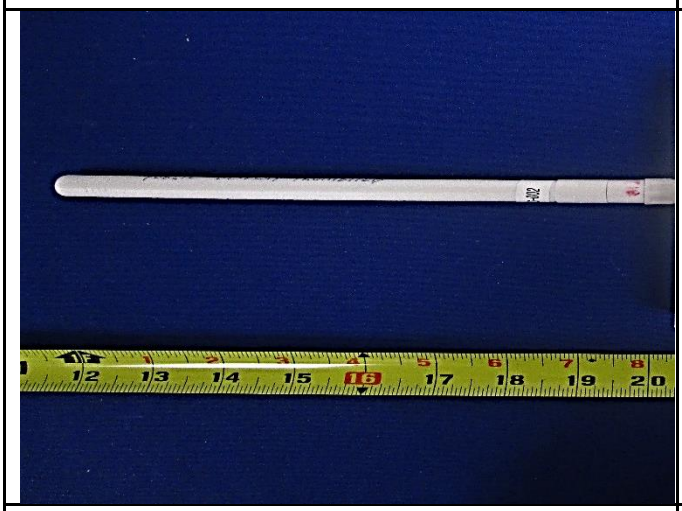
Main PCB - Inside View



Main PCB - Top View



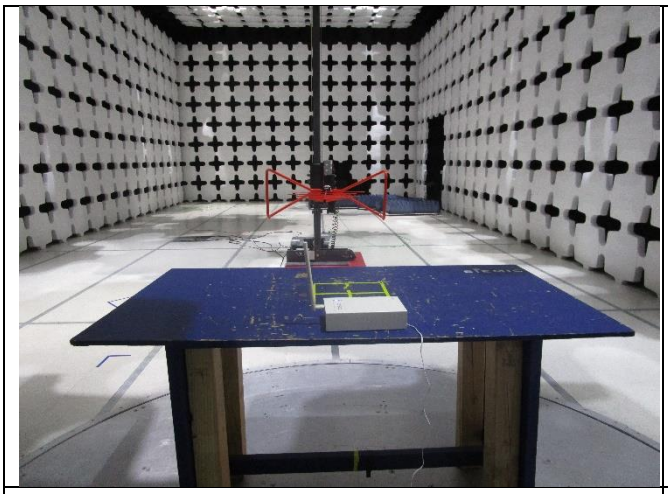
Main PCB - Top View without shielding



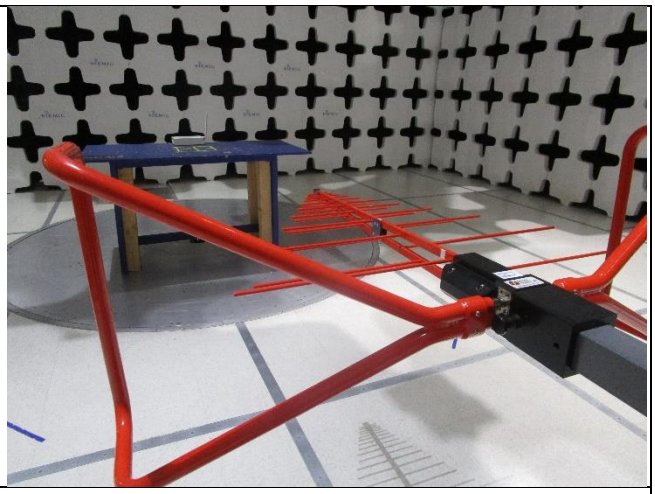
Antenna View

Power Supply View

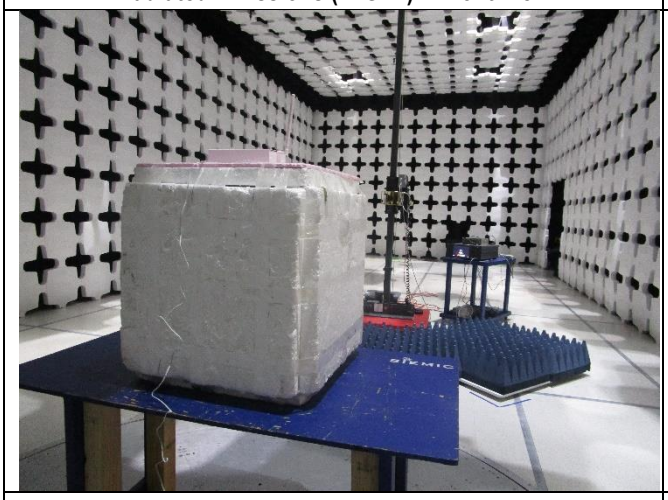
6.6 EUT Test Setup Photos



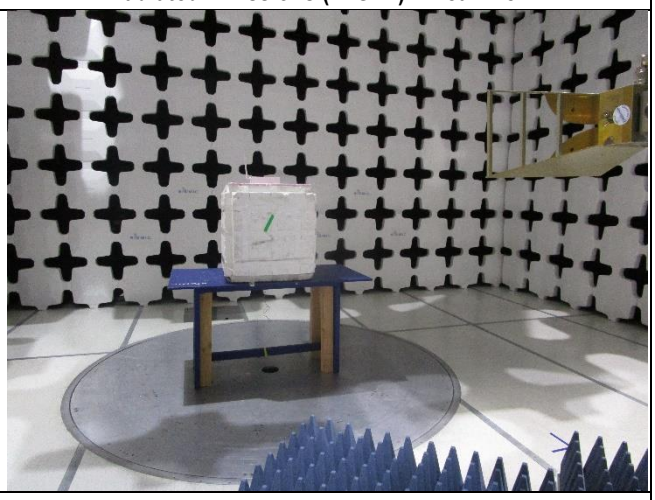
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

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
RF Testing	N/A	Enable EUT continuous TX mode and change to different channel

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. Please refer to FCC ID: F5317LE4010 test report for N/A 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**

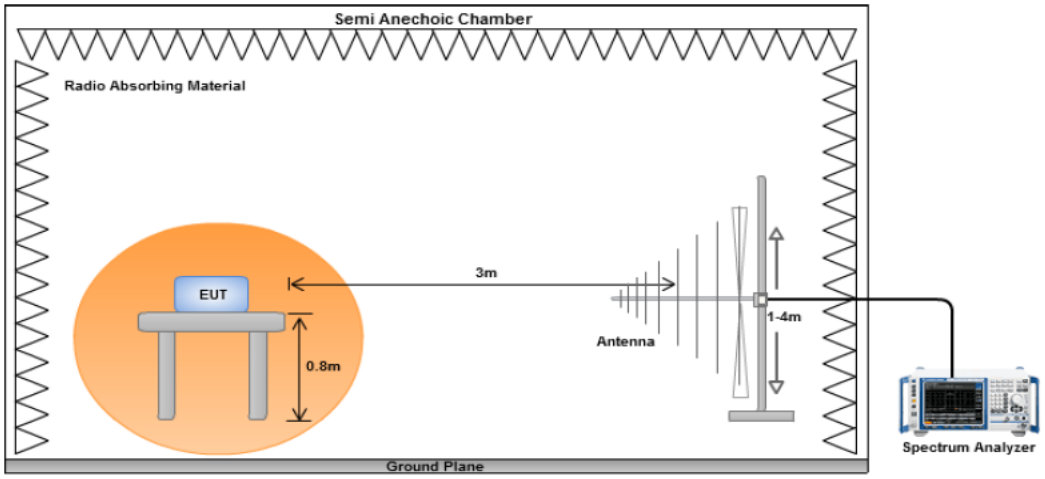
The total derived measurement uncertainty is +/- 0.95 dB.

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	12/03/2017-12/04/2017	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	24°C 42% 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 Rachana Khanduri 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:	13.80 VDC			
Tested by:	Rachana Khanduri			
Test Date:	12/03/2017-12/04/2017			
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)
126.22	-48.95	68	211	V	126.22	-42.24	0	0.33	-42.57	-13	-29.57
126.22	-59.98	110	188	H	126.22	-52.61	0	0.33	-52.94	-13	-39.94
399.57	-62.73	203	210	V	399.57	-51.02	0	0.62	-51.64	-13	-38.64
399.57	-59.60	167	105	H	399.57	-44.30	0	0.62	-44.92	-13	-31.92

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)
77.53	-48.19	237	192	V	77.53	-41.45	0	0.32	-41.77	-13	-28.77
77.53	-56.61	188	178	H	77.53	-47.08	0	0.32	-47.40	-13	-34.40
184.23	-62.22	129	155	V	184.23	-51.29	0	0.43	-51.72	-13	-38.72
184.23	-64.23	189	130	H	184.23	-52.70	0	0.43	-53.13	-13	-40.13

LTE Band5-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)
67.83	-50.36	149	237	V	67.83	-43.62	0	0.31	-43.93	-13	-30.93
67.83	-56.11	250	169	H	67.83	-46.58	0	0.31	-46.89	-13	-33.89
124.09	-57.62	218	188	V	124.09	-50.91	0	0.35	-51.26	-13	-38.26
124.09	-60.28	178	152	H	124.09	-52.91	0	0.35	-53.26	-13	-40.26

LTE Band12-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)
35.98	-54.57	139	112	V	35.98	-51.68	0	0.28	-51.96	-13	-38.96
35.98	-58.23	155	130	H	35.98	-52.12	0	0.28	-52.40	-13	-39.40
125.48	-54.50	173	141	V	125.48	-47.79	0	0.35	-48.14	-13	-35.14
124.94	-59.21	208	188	H	124.94	-51.84	0	0.35	-52.19	-13	-39.19

LTE Band13-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)
66.86	-56.17	33	149	V	66.86	-49.43	0	0.31	-49.74	-13	-36.74
66.86	-57.35	102	155	H	66.86	-47.82	0	0.31	-48.13	-13	-35.13
181.32	-59.93	18	173	V	181.32	-49.00	0	0.42	-49.42	-13	-36.42
181.32	-57.66	199	126	H	181.32	-46.13	0	0.42	-46.55	-13	-33.55

Note: Dipole antenna was used for substitution method.

Radiated Emission Test Results for UMTS

Test specification	Below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	24		
	Humidity (%)	42		
	Atmospheric (mbar):	1012		
Mains Power:	120VAC, 60Hz			
Tested by:	Rachana Khanduri			
Test Date:	12/03/2017-12/04/2017			
Remarks:	UMTS Band 2 and 5			

UMTS band 2 Middle Channel, 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)
106.63	-51.32	15	108	V	106.63	-40.39	0	0.36	-40.75	-13	-27.75
106.63	-54.85	100	120	H	106.63	-43.32	0	0.36	-43.68	-13	-30.68
625.01	-66.97	98	136	V	625.01	-55.19	0	0.66	-55.85	-13	-42.85
625.01	-68.36	116	140	H	625.01	-52.27	0	0.66	-52.93	-13	-39.93

UMTS band 5 Middle Channel, 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)
78.50	-54.58	78	165	V	78.50	-43.65	0	0.32	-43.97	-13	-30.97
78.50	-56.72	138	140	H	78.50	-45.19	0	0.32	-45.51	-13	-32.51
150.28	-61.82	200	128	V	150.28	-52.11	0	0.38	-52.49	-13	-39.49
150.28	-62.33	180	130	H	150.28	-51.03	0	0.38	-51.41	-13	-38.41

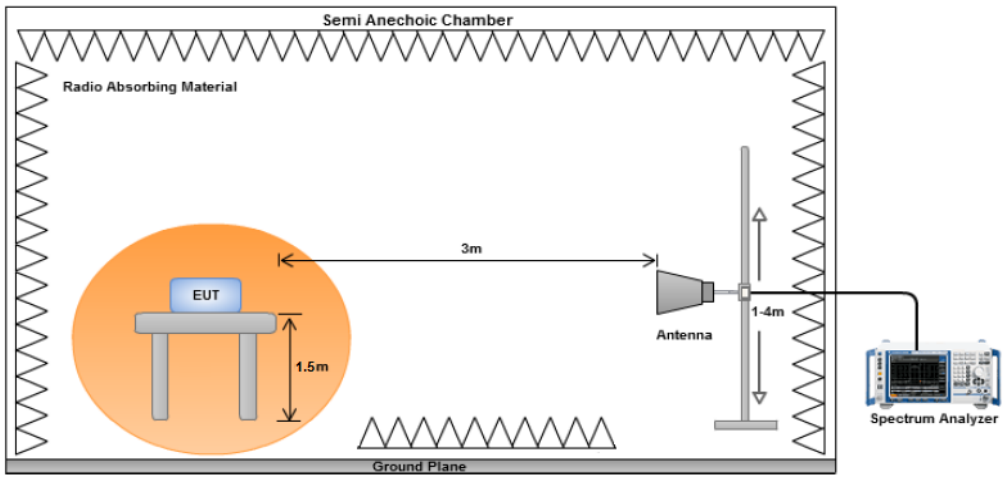
Note: Dipole antenna was used for substitution method.

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	12/03/2017 – 12/04/2017	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 *Rachana Khanduri* 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)
3710.22	-33.10	10	155	V	3710.22	-41.44	11.11	1.94	-32.27	-13	-19.27
3710.22	-45.81	25	156	H	3710.22	-53.30	11.11	1.94	-44.13	-13	-31.13
5579.47	-41.44	0	162	V	5579.47	-43.96	11.82	2.20	-34.34	-13	-21.34
5579.47	-41.14	102	210	H	5579.47	-41.72	11.82	2.20	-32.10	-13	-19.10

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)
3763.57	-36.52	120	176	V	3763.57	-44.82	11.11	2.01	-35.72	-13	-22.72
3763.57	-46.26	111	150	H	3763.57	-53.88	11.11	2.01	-44.78	-13	-31.78
5638.21	-42.02	98	138	V	5638.21	-44.61	12.21	2.24	-34.64	-13	-21.64
5638.21	-41.63	25	140	H	5638.21	-43.00	12.21	2.24	-33.03	-13	-20.03

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)
3806.24	-35.65	35	165	V	3806.24	-43.95	10.77	2.08	-35.26	-13	-22.26
3806.24	-44.27	182	151	H	3806.24	-51.89	10.77	2.08	-43.2	-13	-30.20
5700.11	-41.68	11	179	V	5700.11	-44.27	12.30	2.28	-34.25	-13	-21.25
5700.11	-42.49	58	158	H	5700.11	-43.86	12.30	2.28	-33.84	-13	-20.84

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)
3603.09	-36.72	143	169	V	3603.09	-45.57	11.18	1.52	-35.91	-13	-22.91
3603.09	-47.34	0	213	H	3603.09	-55.62	11.18	1.52	-45.96	-13	-32.96
5132.85	-48.68	19	139	V	5132.85	-50.36	10.65	2.17	-41.88	-13	-28.88
5132.85	-48.68	310	122	H	5132.85	-49.45	10.65	2.17	-40.97	-13	-27.97

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)
3464.90	-34.55	17	150	V	3464.9	-43.4	9.85	1.47	-35.02	-13	-22.02
3464.90	-48.53	98	162	H	3464.9	-50.81	9.85	1.47	-42.43	-13	-29.43
5196.96	-45.8	166	188	V	5196.96	-47.48	10.65	2.21	-39.04	-13	-26.04
5196.96	-47.82	203	130	H	5196.96	-48.59	10.65	2.21	-40.15	-13	-27.15

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)
3507.00	-35.83	9	183	V	3507	-44.68	10.66	1.48	-35.5	-13	-22.50
3507.00	-42.78	119	166	H	3507	-51.06	10.66	1.48	-41.88	-13	-28.88
7014.00	-45.67	215	146	V	7014	-47.35	10.63	3.23	-39.95	-13	-26.95
7014.00	-46.17	14	157	H	7014	-46.94	10.63	3.23	-39.54	-13	-26.54

LTE Band 5 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)
1658.07	-49.33	117	150	V	1658.07	-54.34	10.08	0.73	-44.99	-13	-31.99
1658.07	-48.73	302	155	H	1658.07	-56.38	10.08	0.73	-47.03	-13	-34.03
2488.32	-44.61	141	167	V	2488.32	-54.27	9.48	1.29	-46.08	-13	-33.08
2488.32	-43.59	284	193	H	2488.32	-52.38	9.48	1.29	-44.19	-13	-31.19

LTE Band 5 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)
1673.60	-47.55	20	155	V	1673.6	-52.56	10.08	0.74	-43.22	-13	-30.22
1673.60	-49.35	120	173	H	1673.6	-57	10.08	0.74	-47.66	-13	-34.66
2499.93	-49.20	138	210	V	2499.93	-58.86	9.48	1.29	-50.67	-13	-37.67
2499.93	-48.60	162	188	H	2499.93	-57.39	9.48	1.29	-49.20	-13	-36.20

LTE Band 5 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)
1687.86	-46.73	219	153	V	1687.86	-51.74	10.08	0.74	-42.40	-13	-29.40
1687.86	-47.18	283	160	H	1687.86	-54.83	10.08	0.74	-45.49	-13	-32.49
2532.16	-47.55	119	177	V	2532.16	-57.21	8.91	1.29	-49.59	-13	-36.59
2532.16	-45.32	38	149	H	2532.16	-54.11	8.91	1.29	-46.49	-13	-33.49

LTE Band 12 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)
1407.83	-42.19	112	129	V	1407.83	-46.99	8.74	0.72	-38.97	-13	-25.97
1407.83	-43.53	13	130	H	1407.83	-48.18	8.74	0.72	-40.16	-13	-27.16
2815.99	-45.59	183	179	V	2815.99	-55.18	9.83	1.32	-46.67	-13	-33.67
2815.99	-44.78	110	164	H	2815.99	-53.61	9.83	1.32	-45.10	-13	-32.10

LTE Band 12 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)
1415.02	-44.86	229	150	V	1415.02	-49.66	8.74	0.72	-41.64	-13	-28.64
1415.02	-45.09	105	159	H	1415.02	-49.74	8.74	0.72	-41.72	-13	-28.72
2829.85	-44.31	139	178	V	2829.85	-53.90	9.83	1.32	-45.39	-13	-32.39
2829.85	-44.79	11	193	H	2829.85	-53.62	9.83	1.32	-45.11	-13	-32.11

LTE Band 12 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)
1421.79	-46.17	48	166	V	1421.79	-50.97	8.74	0.72	-42.95	-13	-29.95
1421.79	-45.08	119	120	H	1421.79	-49.73	8.74	0.72	-41.71	-13	-28.71
2429.93	-46.39	284	189	V	2429.93	-55.98	9.83	1.29	-47.44	-13	-34.44
2429.93	-47.27	301	167	H	2429.93	-56.10	9.83	1.29	-47.56	-13	-34.56

LTE Band 13 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)
1558.93	-42.13	211	175	V	1558.93	-46.93	9.57	0.83	-38.19	-13	-25.19
1558.93	-43.76	208	150	H	1558.93	-48.41	9.57	0.83	-39.67	-13	-26.67
3118.11	-44.59	311	152	V	3118.11	-52.98	9.03	1.36	-45.31	-13	-32.31
3118.11	-46.45	293	186	H	3118.11	-53.43	9.03	1.36	-45.76	-13	-32.76

LTE Band 13 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)
1563.99	-43.81	117	141	V	1563.99	-48.61	9.57	0.83	-39.87	-13	-26.87
1563.99	-44.03	109	136	H	1563.99	-48.68	9.57	0.83	-39.94	-13	-26.94
3128.23	-45.17	320	165	V	3128.23	-53.56	9.03	1.36	-45.89	-13	-32.89
3128.23	-44.28	218	177	H	3128.23	-51.26	9.03	1.36	-43.59	-13	-30.59

LTE Band 13 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)
1573.04	-44.17	49	150	V	1573.04	-48.97	9.57	0.83	-40.23	-13	-27.23
1573.04	-45.69	154	178	H	1573.04	-50.34	9.57	0.83	-41.6	-13	-28.60
3137.19	-46.52	186	156	V	3137.19	-54.91	9.03	1.36	-47.24	-13	-34.24
3137.19	-46.83	190	155	H	3137.19	-53.81	9.03	1.36	-46.14	-13	-33.14

UMTS Band 2 Low Channel, 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)
1939.11	-34.62	131	176	V	1939.11	-46.35	11.04	0.94	-36.25	-13	-23.25
1939.11	-32.88	90	184	H	1939.11	-41.76	11.04	0.94	-31.66	-13	-18.66
3722.03	-43.64	33	158	V	3722.03	-51.94	11.11	1.94	-42.77	-13	-29.77
3722.03	-48.13	159	196	H	3722.03	-55.75	11.11	1.94	-46.58	-13	-33.58

UMTS Band 2 Middle Channel, 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)
1960.23	-35.43	47	159	V	1960.23	-47.16	11.04	0.98	-37.10	-13	-24.10
1960.23	-33.71	360	182	H	1960.23	-42.59	11.04	0.98	-32.53	-13	-19.53
5634.89	-42.29	81	179	V	5634.89	-44.88	12.21	2.41	-35.08	-13	-22.08
5634.89	-45.12	203	162	H	5634.89	-46.49	12.21	2.41	-36.69	-13	-23.69

UMTS Band 2 High Channel, 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)
1980.16	-32.87	90	174	V	1980.16	-44.6	11.04	0.98	-34.54	-13	-21.54
1980.16	-34.74	141	180	H	1980.16	-43.62	11.04	0.98	-33.56	-13	-20.56
3802.31	-35.82	304	169	V	3802.31	-44.12	10.77	1.96	-35.31	-13	-22.31
3802.31	-41.83	142	185	H	3802.31	-49.45	10.77	1.96	-40.64	-13	-27.64

UMTS Band 5 Low Channel, 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)
1670.87	-25.42	124	254	V	1670.87	-40.41	10.08	0.74	-31.07	-13	-18.07
1670.87	-41.77	68	155	H	1670.87	-49.42	10.08	0.74	-40.08	-13	-27.08
2475.79	-43.27	203	152	V	2475.79	-49.93	9.48	1.29	-41.74	-13	-28.74
2475.79	-48.86	110	198	H	2475.79	-54.65	9.48	1.29	-46.46	-13	-33.46

UMTS Band 5 Middle Channel, 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)
1673.30	-26.82	17	176	V	1673.30	-41.81	10.08	0.74	-32.47	-13	-19.47
1687.30	-42.41	182	149	H	1687.30	-50.06	10.08	0.74	-40.72	-13	-27.72
2521.17	-45.36	205	150	V	2521.17	-52.02	8.91	1.29	-44.40	-13	-31.40
2521.17	-49.68	83	155	H	2521.17	-55.47	8.91	1.29	-47.85	-13	-34.85

UMTS Band 5 High Channel, 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)
1690.48	-28.16	144	159	V	1690.48	-43.15	10.08	0.74	-33.81	-13	-20.81
1690.48	-42.40	109	145	H	1690.48	-50.05	10.08	0.74	-40.71	-13	-27.71
2528.90	-45.90	158	172	V	2528.90	-52.56	8.91	1.29	-44.94	-13	-31.94
2528.90	-49.88	21	150	H	2528.90	-55.67	8.91	1.29	-48.05	-13	-35.05

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	08/03/2017	1 Year	08/03/2018	☑
Pre-Amplifier (1-40GHz)	SAS-474	579	04/04/2017	1 Year	04/04/2018	☑
Preamplifier (100KHz-7GHz)	LPA-6-30	11140711	02/09/2017	1 Year	02/09/2018	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	01/13/2017	1 Year	01/13/2018	☑
Horn Antenna (1-18GHz)	3115	10SL0059	11/09/2017	1 Year	11/09/2018	☑
Horn Antenna (700MHz-18GHz)	SAS-571	411	05/13/2017	1 Year	05/13/2018	☑
Tuned Dipole Antenna 30 - 1000 MHz (4pcs set)	AD-100	40133	03/08/2017	1 Year	03/08/2018	☑

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