RF TEST REPORT

SIEMIC
A Bureau Veritas Group Company

Report No.: FCC IC_RF_SL19022001-ORB-001
Supersede Report No.: None

Applicant (FCC)	:	ORBCOMM Inc.
Product Name	:	TripLINK 12LB (CT4000)
Model No.	:	TripLINK 12LB
Test Standard	:	47 CFR 15.247 RSS 247 Iss 2: Feb 2017
Test Method	:	ANSI C63.10: 2013 RSS Gen Iss 5: April 2018
FCC ID	:	XGS-RL76052
Contains FCC IDs	:	BT: XGS-UNNB30 / Cellular: XPY1EHM44NN
IC	:	11881A-RL76052
Contains IC:	:	BT: 11881A-UNNB30 / Cellular: 8595A-1EHM44NN
Dates of test	:	05/20/2019
Issue Date	:	05/24/2019
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification [X] Equipment did not comply with the specification [ ]		

This Test Report is Issued Under the Authority of:	
Gary Chou	
Gary Chou	**Chen Ge**
Compliance Engineer	Engineer Reviewer

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
Hong Kong	OFTA (US002)	RF, Telecom

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1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC IC_RF_SL19022001-ORB-001	None	Original	05/24/2019

2 Executive Summary

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

Company: ORBCOMM Inc.
Product: TripLINK 12LB (CT4000)
Model No.: TripLINK 12LB

against the current Stipulated Standards. The specified model product stated above has demonstrated compliance with the Stipulated Standard listed on 1st page. This test report covers the radiated emissions requirements of the standards referenced in the report to allow system level approval of the modules in specified Hosts.

3 Customer information

Applicant Name	ORBCOMM Inc.
Applicant Address	395 W Passaic Street, Suite 325, Rochelle Park, NJ 07662 USA
Manufacturer Name	ORBCOMM Inc.
Manufacturer Address	395 W Passaic Street, Suite 325, Rochelle Park, NJ 07662 USA

4 Test site information

Lab performing tests	SIEMIC Laboratories
Lab Address	775 Montague Expressway, Milpitas, CA 95035
FCC Test Site No.	540430
IC Test Site No.	4842D
VCCI Test Site No.	A0133

5 Modification

Index	Item	Description	Note
-	-	-	-

6 EUT Information

6.1 EUT Description

Model No.	TripLINK 12LB
Trade Name	ORBCOMM
Serial No.	JTCB819070029
Input Power	24VDC
Date of EUT received	05/01/2019

6.2 Spec for LoRaWan Radio

Radio Type	LoRaWan
Operating Frequency	903.0-914.2MHz
Modulation	Lora
Channel Spacing	1.6MHz
Antenna Type	PCB Antenna
Antenna Gain (Peak)	0.5 dBi
Antenna Connector Type	N/A

Type	Channel No.	Frequency (MHz)
LoRaWAN 125 KHz Bandwidth	0	903.0
	4	909.4
	7	914.2

6.3 EUT test modes/configuration Description

Mode	Note
LoRaWAN	Continous transmission

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	PP01L Latitude E5440	F1WPF12	Dell	-

7.2 Cabling Description

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

7.3 Test Software Description

Test Item	Software	Description
Spurious emission	TeraTerm	Set the EUT to transmit continuously in diferent test mode

8 Test Summary

DTS Band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Radiated Spurious Emissions	FCC	15.247, 15.209	FCC	ANSI C63.10:2013	☒ Pass ☐ N/A
	IC	RSS 247, RSS-GEN	IC		
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. Only Radiated Spurious Emission was testing for Host configuration. 4. Conducted measurements for TripLINK 12LB are in the following reports: RHF76-052 Module (FCC ID: 2AJUZ76052) Report No: BL-SZ16A0433-602 RHF76-052DM Module (IC: 22005-76052) Report No.: CQASZ20190300179E-02				

9 Measurement Uncertainty

Emissions			
Test Item	**Frequency Range**	**Description**	**Uncertainty**
AC Conducted Emissions	150KHz – 30MHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±3.5dB
RF conducted measurement	150KHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±0.95dB
Radiated Spurious Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	±6dB
Radiated Spurious Emissions	1GHz – 40GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	±6dB

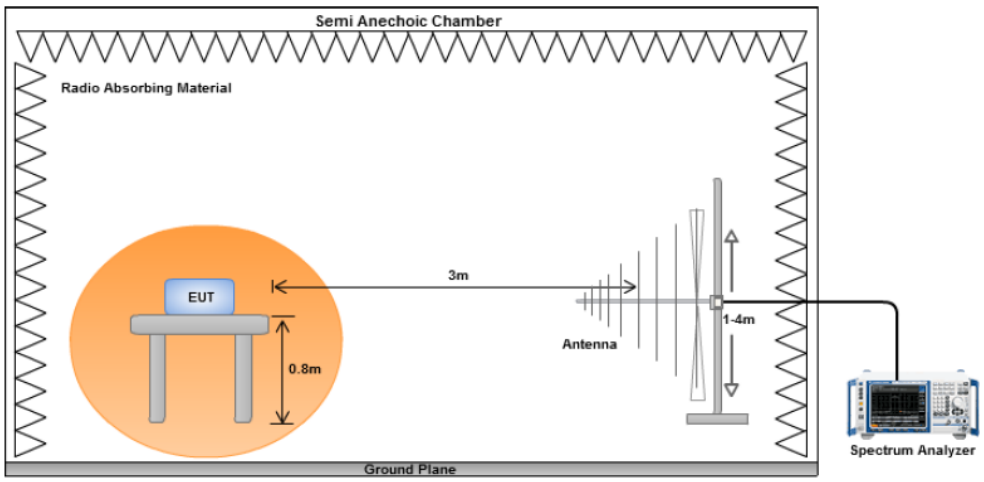
10 Measurements, Examination and Derived Results

10.1 Radiated Spurious Emissions below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d) RSS247 (5.5)	a)	Except higher limit as specified elsewhere in other section, the emissions from the low-power radio-frequency devices shall not exceed the field strength levels specified in the following table and the level of any unwanted emissions shall not exceed the level of the fundamental emission. The tighter limit applies at the band edges	☒

Frequency range (MHz)	Field Strength (uV/m)
30 – 88	100
88 – 216	150
216 960	200
Above 960	500

Test Setup	
Procedure	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. A Quasi-peak measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.
Remark	The EUT was scanned up to 1GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.
Result	☒ Pass ☐ Fail

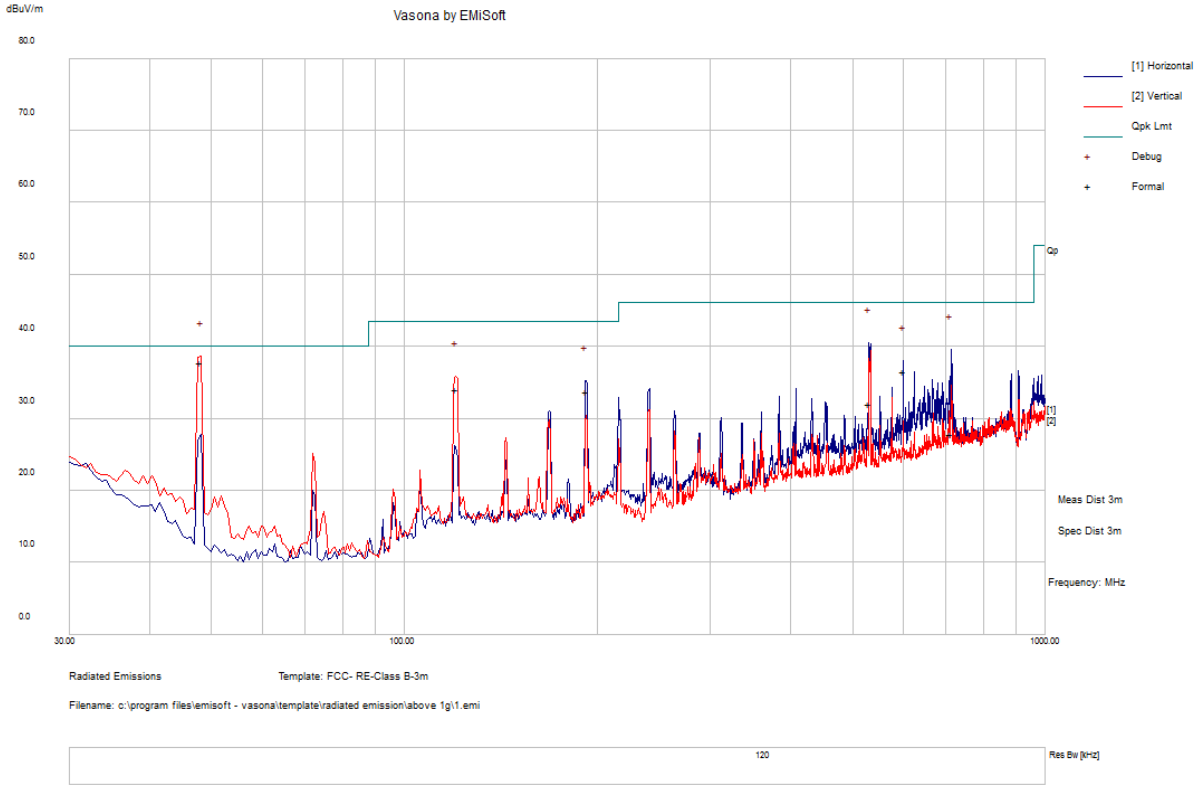
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Gary Chou at 10m chamber.

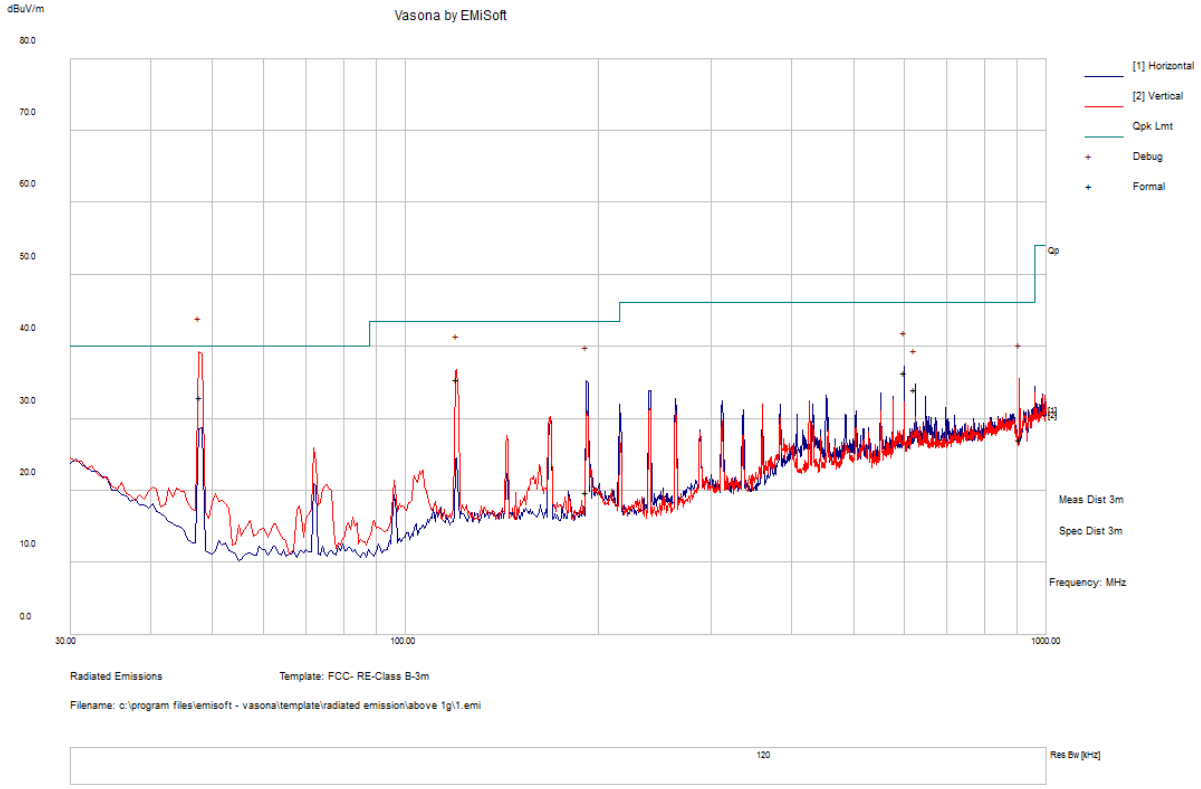
Radiated Emission Test Results (Below 1GHz)

Test specification	Below 1GHz			
Environmental Conditions:	Temp (°C):	22	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	12V DC			
Tested by:	Gary Chou			
Test Date:	05/20/2019			
Remarks:	Middle Channel			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
48.01	51.78	11.43	-25.42	37.79	Quasi Max	V	101	262	40	-2.22	Pass
530.99	35.4	14.46	-17.82	32.04	Quasi Max	H	116	86	46	-13.96	Pass
711.63	27.89	15.19	-15.14	27.95	Quasi Max	H	110	211	46	-18.05	Pass
120.16	44.54	12.07	-22.58	34.02	Quasi Max	V	102	103	43.5	-9.48	Pass
599.98	38.4	14.69	-16.53	36.56	Quasi Max	H	130	163	46	-9.44	Pass
191.99	46.11	12.54	-24.92	33.73	Quasi Max	H	190	86	43.5	-9.77	Pass

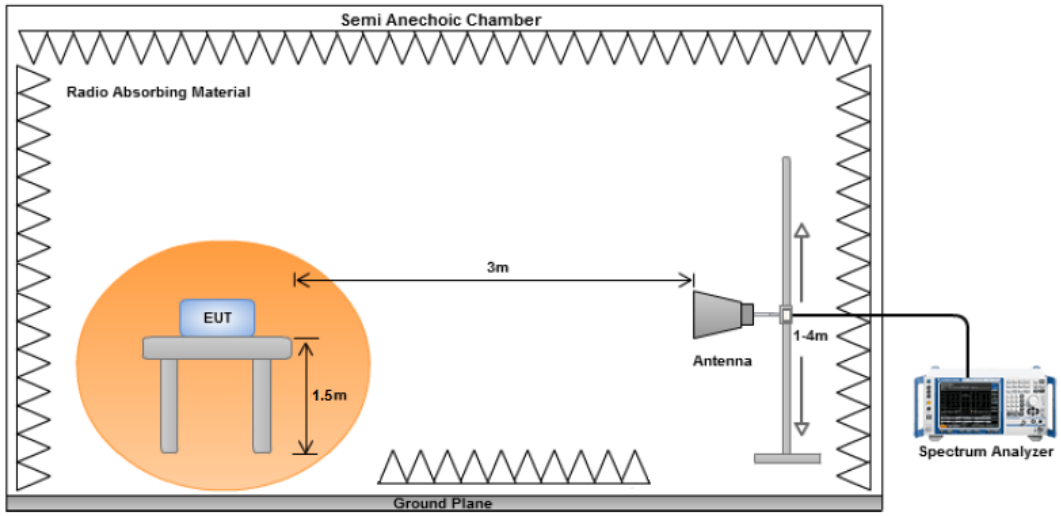
Test specification	Below 1GHz			
Environmental Conditions:	Temp (°C):	22	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	12V DC			
Tested by:	Gary Chou			
Test Date:	05/20/2019			
Remarks:	Test results for Simultaneous Transmission with Lora, GSM, and BT			



Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
47.82	46.88	11.43	-25.31	33	Quasi Max	V	194	156	40	-7	Pass
120.18	46.09	12.07	-22.58	35.57	Quasi Max	V	101	260	43.5	-7.93	Pass
191.44	32.24	12.54	-25.01	19.77	Quasi Max	H	263	172	43.5	-23.73	Pass
599.98	38.25	14.69	-16.53	36.41	Quasi Max	H	101	148	46	-9.59	Pass
908.58	23.99	15.92	-12.79	27.13	Quasi Max	V	340	22	46	-18.87	Pass
623.99	36.01	14.58	-16.55	34.04	Quasi Max	H	148	149	46	-11.96	Pass

10.2 Radiated Spurious Emissions between 1GHz – 25GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS247(A8.5)	a)	For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be at least 20 dB or 30dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, determined by the measurement method on output power to be used. Attenuation below the general limits specified in § 15.209(a) is not required ☐ 20 dB down ☒ 30 dB down	☒
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	☒
Test Setup			
Procedure	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. An average measurement was then made for that frequency point. 4. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured.		
Remark	The EUT was scanned up to 25GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Gary Chou at 10m chamber.

Radiated Emission Test Results (Above 1GHz)

Test specification	Above 1GHz			
Environmental Conditions:	Temp (°C):	22	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	12V DC			
Tested by:	Gary Chou			
Test Date:	05/21/2018			
Remarks:	-			

Low channel

Frequency (MHz)	Raw (dBuV)	Factor (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
8119.42	47.23	4.64	51.87	Peak Max	H	180	266	74	-22.13	Pass
1944.159	47.51	-0.07	47.44	Peak Max	V	151	61	74	-26.56	Pass
3293.971	42.35	1.09	43.44	Peak Max	H	134	116	74	-30.56	Pass
8119.42	34.12	4.64	38.76	Average Max	H	180	266	54	-15.24	Pass
1944.154	30.32	-0.07	30.25	Average Max	V	151	61	54	-23.75	Pass
3293.977	30.23	1.09	31.32	Average Max	H	134	116	54	-22.68	Pass

Middle channel

Frequency (MHz)	Raw (dBuV)	Factor (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
8170.5	47.14	4.66	51.8	Peak Max	H	180	266	74	-22.2	Pass
1944.156	47.13	-0.07	47.06	Peak Max	V	151	61	74	-26.94	Pass
3293.916	42.46	1.09	43.55	Peak Max	H	134	116	74	-30.45	Pass
8170.19	34.45	4.66	39.11	Average Max	H	180	266	54	-14.89	Pass
1944.126	30.28	-0.07	30.21	Average Max	V	151	61	54	-23.79	Pass
3293.946	30.61	1.09	31.7	Average Max	H	134	116	54	-22.3	Pass

High channel

Frequency (MHz)	Raw (dBuV)	Factor (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
8227.84	47.41	4.63	52.04	Peak Max	H	180	266	74	-21.96	Pass
1944.163	47.26	-0.07	47.19	Peak Max	V	151	61	74	-26.81	Pass
3293.942	42.65	1.09	43.74	Peak Max	H	134	116	74	-30.26	Pass
8227.73	34.34	4.64	38.98	Average Max	H	180	266	54	-15.02	Pass
1944.161	30.23	-0.07	30.16	Average Max	V	151	61	54	-23.84	Pass
3293.984	30.41	1.09	31.5	Average Max	H	134	116	54	-22.5	Pass

Note: The testing was based on highest power setting.

Test specification	Above 1GHz			
Environmental Conditions:	Temp (°C):	22	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	12V DC			
Tested by:	Gary Chou			
Test Date:	05/20/2019			
Remarks:	Test results for Simultaneous Transmission with Lora, GSM, and BT			

Middle channel

Frequency (MHz)	Raw (dBuV)	Factor (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
8170.2	47.18	4.66	51.84	Peak Max	H	180	266	74	-22.16	Pass
1944.153	47.17	-0.07	47.1	Peak Max	V	151	61	74	-26.9	Pass
3293.975	42.42	1.09	43.51	Peak Max	H	134	116	74	-30.49	Pass
8170.2	34.53	4.66	39.19	Average Max	H	180	266	54	-14.81	Pass
1944.153	30.24	-0.07	30.17	Average Max	V	151	61	54	-23.83	Pass
3293.975	30.67	1.09	31.76	Average Max	H	134	116	54	-22.24	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
50GHz Spectrum Analyzer	N9030B (PXA)	MY57140374	01/25/2019	1 Year	01/25/2020	☑
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	03/09/2018	2 Year	03/09/2020	☑
Horn Antenna (1-18GHz)	3115	10SL0059	01/26/2018	2 Year	01/26/2020	☑
RF Pre-Amplifier (9kHz - 6.5GHz)	LPA-6-30	11170601	07/23/2018	1 Year	07/23/2019	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	05/16/2019	1 Year	05/16/2020	☑

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 & Telecommunications Terminal Equipment:** EN45001 – EN ISO/IEC 17025
		Electromagnetic Compatibility: EN45001 – EN ISO/IEC 17025
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
		Radio communications: 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