



RF TEST REPORT



Report No.: FCC IC_RF_SL18021901-XIR-001
Supersede Report No.: N/A

Applicant	:	Xirgo Technologies
Product Name	:	XT6475A Global LTE CAT1 Container Monitoring Device
Model No.	:	XT6475A
Test Standard	:	FCC 15.247 RSS-247 Issue 2, February 2017
Test Method	:	ANSI C63.10: 2013 RSS Gen Iss 4: Nov 2014 558074 D01 DTS Meas Guidance v04 971168 D01 Power Meas License Digital Systems v03
FCC ID	:	GKM-XT6475A
IC ID	:	10281A-XT6475A
Dates of test	:	02/27/2018 – 03/21/2018
Issue Date	:	03/22/2018
Test Result	:	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail
Equipment complied with the specification [X] Equipment did not comply with the specification []		

This Test Report is Issued Under the Authority of:	
	
Cipher	Chen Ge
Test Engineer	Engineer Reviewer

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



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 & R&TTE Directive
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_SL18021901-XIR-001	None	Original	03/22/2018

2 Executive Summary

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

Company: Xirgo Technologies
Product: XT6475A Global LTE CAT1 Container Monitoring Device
Model: XT6475A

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	:	Xirgo Technologies
Applicant Address	:	188 Camino Ruiz, Camarillo, CA 93012
Manufacturer Name	:	Xirgo Technologies
Manufacturer Address	:	188 Camino Ruiz, Camarillo, CA 93012

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	:	XT6475A Global LTE CAT1 Container Monitoring Device
Model No.	:	XT6475A
Trade Name	:	Xirgo
Serial No.	:	N/A
Input Power	:	33VDC
Date of EUT received	:	02/28/2018
Equipment Class/ Category	:	DTS
Port/Connectors	:	None

6.2 Spec for Radio

Radio Type	ZigBee
Operating Frequency	2405MHz-2475MHz
Modulation	OQPSK
Channel Spacing	5MHz
Antenna Type	Ceramic Chip
Antenna Gain	-1 dBi
Antenna Connector Type	N/A

Radio Type	LTE
Operating Frequency	Band2, Band4, Band5, Band12
Modulation	QPSK, 16QAM, 64QAM
Channel Spacing	5MHz, 10MHz, 15MHz, 20MHz,
Antenna Type	Internal
Antenna Gain (Peak)	-2 dBi
Antenna Connector Type	Integrated

6.3 EUT test modes/configuration Description

Mode	Note
Zigbee	Continuously transmit
LTE	Normal mode

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	N/A	3YZQ162	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	
USB	USB	EUT	USB	Laptop	USB	1	Unshielded

7.3 Test Software Description

Test Item	Software	Description
RF Testing	TeraTerm	Set the EUT to transmit continuously in different test mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r05	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 8.10	IC		<input type="checkbox"/> N/A
AC Conducted Emissions	FCC	15.207(a)	FCC	ANSI C63.10:2013	<input type="checkbox"/> Pass
	IC	RSS Gen 8.8	IC	RSS Gen Issue 4: 2014	<input checked="" type="checkbox"/> N/A
Antenna Requirement	FCC	15.203	FCC	-	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> N/A

DTS Band Requirement

Test Item	Test standard		Test Method/Procedure		Pass / Fail
99% Occupied Bandwidth	-	-	-	-	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen 6.6	IC	RSS Gen Issue 4: 2014 -	<input type="checkbox"/> N/A
6dB Bandwidth	FCC	15.247(a)(2)	FCC	558074 D01 DTS Meas Guidance v03r05	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.2.1)	IC		<input type="checkbox"/> N/A
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	ANSI C63.10:2013 558074 D01 DTS Meas Guidance v03r05	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.5)	IC		<input type="checkbox"/> N/A
Output Power	FCC	15.247(b)	FCC	558074 D01 DTS Meas Guidance v03r05	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.4.4)	IC		<input type="checkbox"/> N/A
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	<input type="checkbox"/> Pass
	IC	-	IC	-	<input checked="" type="checkbox"/> N/A
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r05	<input checked="" type="checkbox"/> Pass
	IC	RSS247 (5.2.2)	IC		<input type="checkbox"/> N/A
RF Exposure requirement	FCC	15.247(i)	FCC	-	<input checked="" type="checkbox"/> Pass
	IC	RSS Gen(5.5)	IC	RSS Gen Issue 4: 2014	<input type="checkbox"/> N/A
Remark	<ol style="list-style-type: none"> All measurement uncertainties do not take into consideration for all presented test results. 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. 				

9 Measurement Uncertainty

9.1 Conducted Emissions

The test is to measure the conducted emissions to the mains port of the EUT.

Some error sources that can contribute to the total uncertainty:

- Uncertainty of the receiver
- Uncertainty of the LISN
- Uncertainty of cables
- Uncertainty due to the mismatches
- Etc, see the below table for details

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
LISN Insertion Loss	0.40	Normal	2	1	0.20
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 LISN - Receiver	0.25	U-Shape	1.414	1	0.1768033
LISN Impedance	2.5	Triangular	2.449	1	1.0208248
Combined Standard Uncertainty					1.928133
Expanded Uncertainty (K=2)					3.856266

The total derived measurement uncertainty is +/- 3.86 dB.

9.2 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.

9.3 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.

9.4 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.

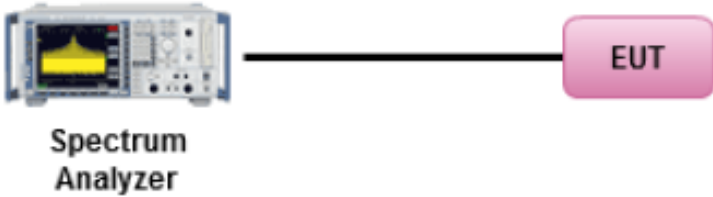
10 Measurements, Examination and Derived Results

10.1 Antenna Requirement

Spec	Item	Requirement	Applicable
15.203	-	<p>An intentional radiator shall be designed to ensure that no antenna other than that furnished by the responsible party shall be used with the device.</p> <p>Antenna requirement must meet at least one of the following:</p> <p>a) Antenna must be permanently attached to the device.</p> <p>b) Antenna must use a unique type of connector to attach to the device.</p> <p>c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.</p>	<input checked="" type="checkbox"/>
Remark	EUT has an unique antenna connector which meets the requirement.		
Result	<input checked="" type="checkbox"/> PASS <input type="checkbox"/> FAIL		

10.2 6dB & 99% Bandwidth

Requirement(s):

Spec	Requirement	Applicable
§ 15.247 RSS247 (5.2.1)	6dB BW≥500KHz;	<input checked="" type="checkbox"/>
RSS Gen 4.6.1	The transmitter shall be operated at its maximum carrier power measured under normal test conditions. The span of the analyzer shall be set to capture all products of the modulation process, including the emission skirts. The resolution bandwidth shall be set to as close to 1% of the selected span as is possible without being below 1%. The video bandwidth shall be set to 3 times the resolution bandwidth. Video averaging is not permitted. Where practical, a sampling detector shall be used given that a peak or peak hold may produce a wider bandwidth than actual. The trace data points are recovered and directly summed in linear terms. The recovered amplitude data points, beginning at the lowest frequency, are placed in a running sum until 0.5% of the total is reached and that frequency recorded. The process is repeated for the highest frequency data points. This frequency is recorded. The span between the two recorded frequencies is the occupied bandwidth	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>	
Test Procedure	558074 D01 DTS Meas Guidance v04, 8.1 DTS bandwidth <u>6dB Emission bandwidth measurement procedure</u> <ul style="list-style-type: none"> - Set RBW = 100 kHz. - Set the video bandwidth (VBW) ≥ 3 x RBW. - Detector = Peak. - Trace mode = max hold. - Sweep = auto couple. - Allow the trace to stabilize. - Measure the maximum width of the emission that is constrained by the frequencies associated with the two outermost amplitude points (upper and lower frequencies) that are attenuated by 6 dB relative to the maximum level measured in the fundamental emission. 	
Test Date	03/21/2018	Environmental condition Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A	
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail	

Test Data Yes N/A

Test Plot Yes N/A

Test was done by CIPHER CHU at RF test site.

6dB Bandwidth measurement result

Type	Test mode	Freq (MHz)	CH	Result (MHz)	Limit (MHz)	Result
6dB BW	Zigbee	2405	Low	1.56	≥0.5	Pass
6dB BW	Zigbee	2440	Mid	1.43	≥0.5	Pass
6dB BW	Zigbee	2475	High	1.44	≥0.5	Pass

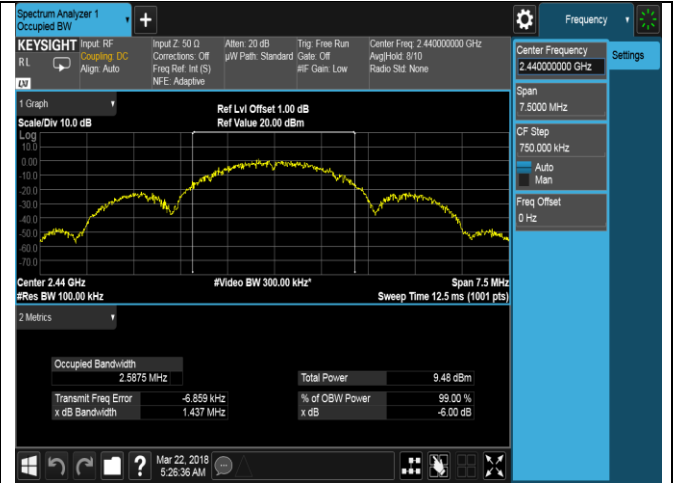
99% OBW measurement result for 2.4GHz

Type	Test mode	Freq (MHz)	CH	Result (MHz)
99% OBW	Zigbee	2405	Low	2.60
99% OBW	Zigbee	2440	Mid	2.58
99% OBW	Zigbee	2475	High	2.62

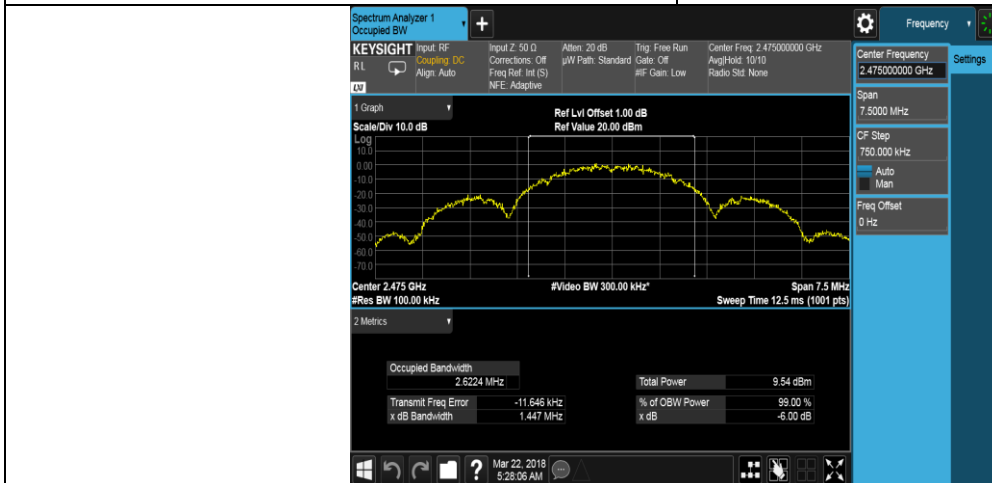
6dB & 99% Bandwidth Test Plots



6dB BW – Zigbee 2402MHz



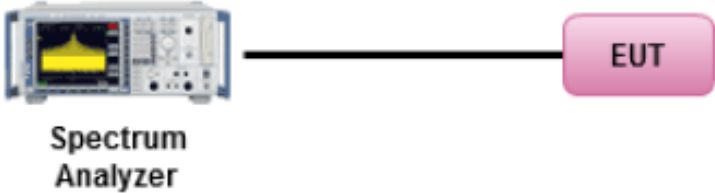
6dB BW – Zigbee 2440MHz



6dB BW – Zigbee 2480MHz

10.3 Output Power

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247 RSS247 (5.4.4)	f)	DSSS in 902-928MHz, 2400-2483.5MHz, 5725-5850MHz: ≤1 Watt	<input checked="" type="checkbox"/>
Test Setup	 <p style="text-align: center;">Spectrum Analyzer EUT</p>		
Test Procedure	<p>558074 D01 DTS Meas Guidance v04, 9.1.1</p> <p><u>Measurement using a Spectrum Analyzer (SA)</u></p> <ol style="list-style-type: none"> Set the span to 1.5 times the DTS bandwidth. Set RBW ≥ DTS bandwidth. Set VBW ≥ 3 x RBW. Sweep Time = auto couple. Detector = Peak. Trace Mode = max hold. Allow trace to fully stabilize. Use peak marker function to determine the peak amplitude level. 		
Test Date	03/21/2018	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test was done by Cipher Chu at RF test site.

Output Power measurement result

Type	Test mode	Freq (MHz)	CH	Conducted Power (dBm)	Limit (dBm)	Result
Output power	Zigbee	2405	Low	6.96	30	Pass
	Zigbee	2440	Mid	6.98	30	Pass
	Zigbee	2475	High	6.90	30	Pass

Test Plots



Output Power – Zigbee 2405MHz

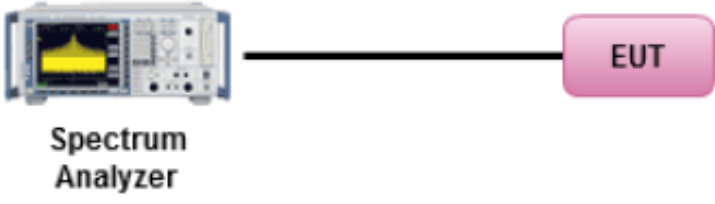
Output Power – Zigbee 2440MHz



Output Power – Zigbee 2480MHz

10.4 Band Edge

Requirement(s):

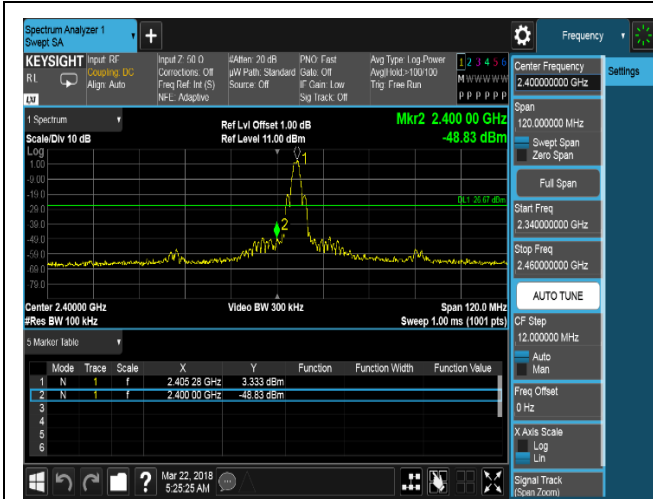
Spec	Item	Requirement	Applicable
§ 15.247 RSS247(5.5)	d)	For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator shall be 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 <input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down	☒
Test Setup			
Test Procedure	<p>558074 D01 DTS Meas Guidance v04</p> <p><u>Band Edge measurement procedure</u></p> <ol style="list-style-type: none"> 1. Set the EUT to maximum power setting and enable the EUT transmit continuously. 2. Band edge emissions must be at least 30 dB down from the highest emission level within the authorized band as a measured. The attenuation shall be 30 dB instead of 20 dB when Peak conducted output power procedure is used. 3. Change modulation and channel bandwidth then repeat step 1 to 2. 4. Measured and record the results in the test report. 		
Test Date	03/21/2018	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

Test Plot Yes (See below) N/A

Test was done by Cipher Chu at RF test site.

Band Edge Test Plots



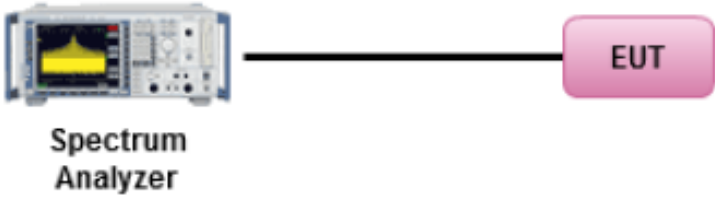
Band Edge-LE Low



Band Edge-LE High

10.5 Peak Spectral Density

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(e) RSS247 (5.2.2)	1	For digitally modulated systems, the power spectral density conducted from the intentional radiator to the antenna shall not be greater than 8 dBm in any 3 kHz band during any time interval of continuous transmission.	<input checked="" type="checkbox"/>
Test Setup			
Test Procedure	558074 D01 DTS Meas Guidance v04, 10.2 Method PKPSD (peak PSD) <u>Peak spectral density measurement procedure</u> <ul style="list-style-type: none"> - Set analyzer center frequency to DTS channel center frequency. - Set the span to 1.5 times the DTS bandwidth. - Set the RBW to: $3 \text{ kHz} \leq \text{RBW} \leq 100 \text{ kHz}$. - Set the VBW $\geq 3 \times \text{RBW}$. - Detector = Peak - Sweep time = auto couple. - Trace mode = Max Hold - Allow trace to fully stabilize. - Use the peak marker function to determine the maximum amplitude level within the RBW. - If measured value exceeds limit, reduce RBW (no less than 3 kHz) and repeat. 		
Test Date	03/21/2018	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar
Remark	-		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes N/A

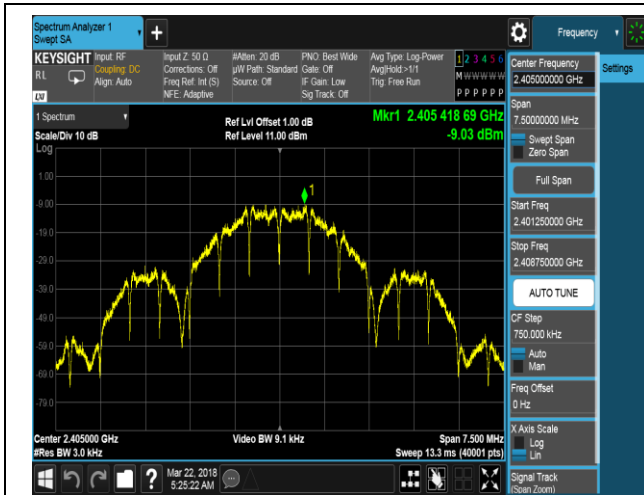
Test Plot Yes (See below) N/A

Test was done by Cipher Chu at RF test site.

PSD measurement result

Type	Test mode	Freq (MHz)	CH	Conducted PSD (dBm/3KHz)	Limit (dBm/3KHz)	Result
PSD	Zigbee	2405	Low	-9.03	≤8	Pass
PSD	Zigbee	2440	Mid	-8.32	≤8	Pass
PSD	Zigbee	2475	High	-8.23	≤8	Pass

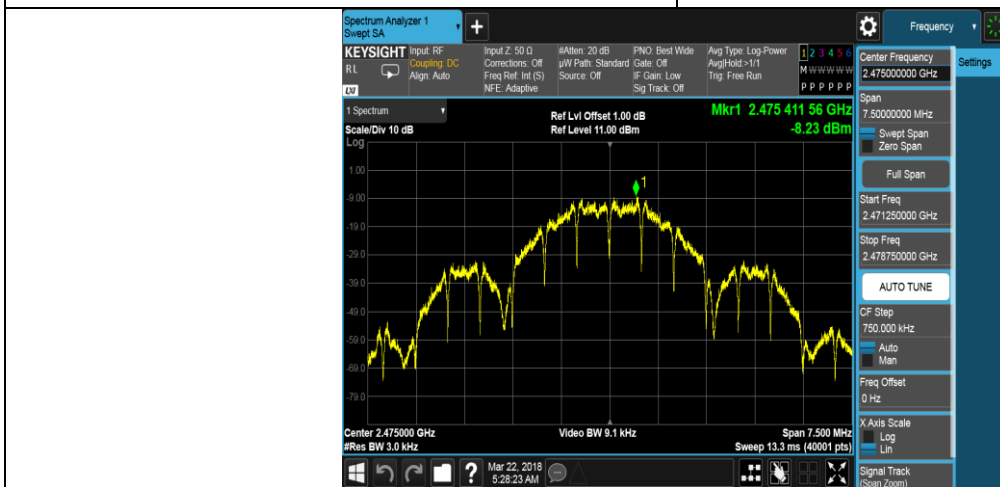
Test Plots



PSD - Zigbee Low



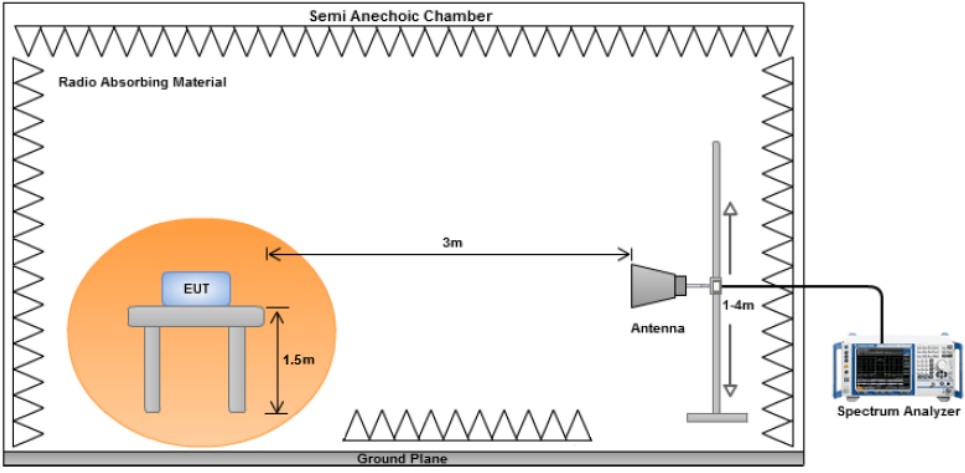
PSD - Zigbee Mid



PSD - Zigbee High

10.6 Radiated Spurious Emissions in restricted band

Requirement(s):

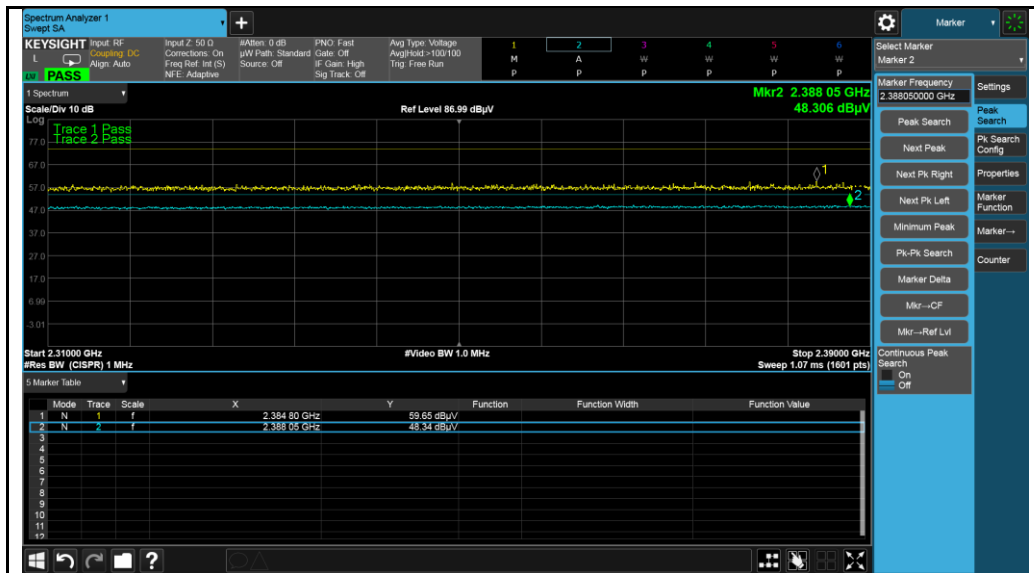
Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS247(A8.5)	a)	For non-restricted band, In any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated intentional radiator is operating, the radio frequency power that is produced by the intentional radiator 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 <input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down	<input checked="" type="checkbox"/>
	b)	Or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>
Test Setup			
Procedure	<ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. 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: <ol style="list-style-type: none"> Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. An average measurement was then made for that frequency point. Steps 2 and 3 were repeated for the next frequency point, until all selected frequency points were measured. 		
Remark	Both horizontal and vertical polarities were investigated. The results show only the worst case.		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes (See below) N/A

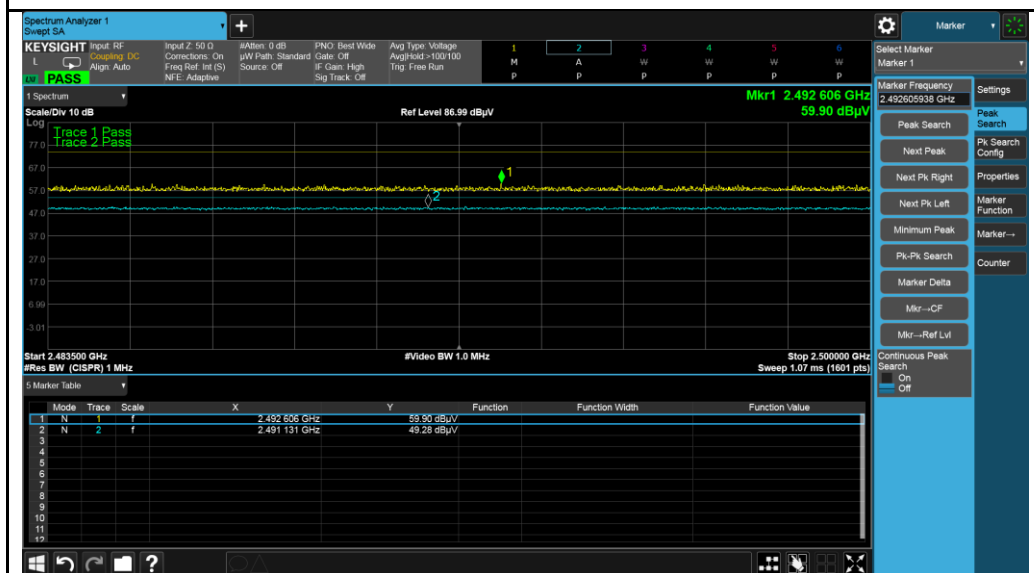
Test Plot Yes (See below) N/A

Test was done by CIPHER CHU at 10m chamber.

Restricted Band Measurement Plots:



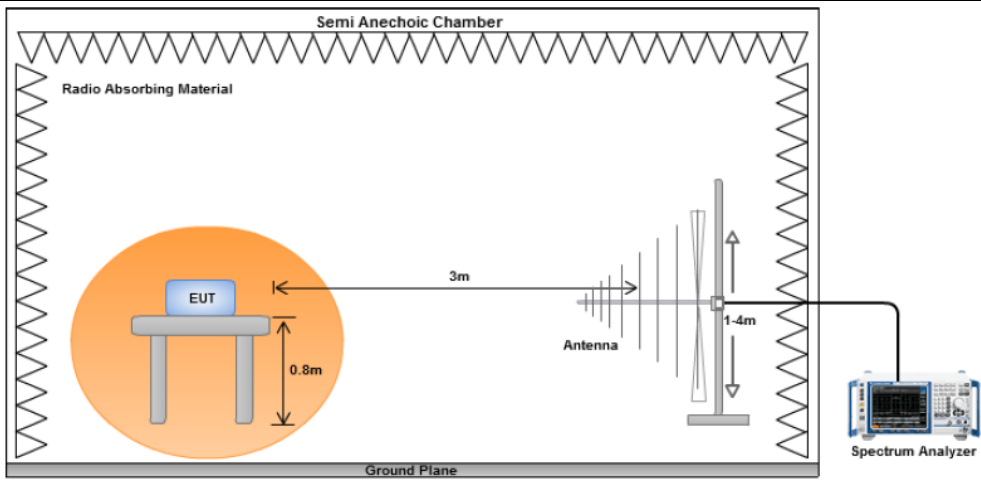
Restricted Band 2402MHz



Restricted Band 2480MHz

10.7 Radiated Spurious Emissions below 1GHz

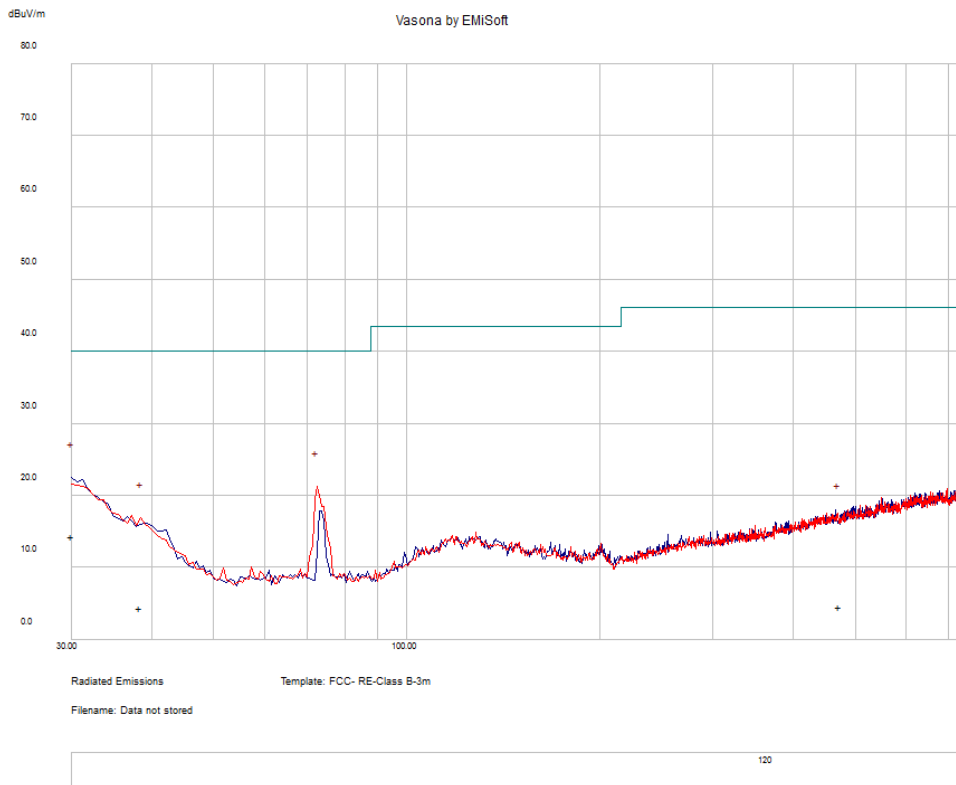
Requirement(s):

Spec	Item	Requirement	Applicable										
47CFR§15.247(d) RSS247 (5.5)	a)	<p>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</p> <table border="1"> <thead> <tr> <th>Frequency range (MHz)</th> <th>Field Strength (uV/m)</th> </tr> </thead> <tbody> <tr> <td>30 – 88</td> <td>100</td> </tr> <tr> <td>88 – 216</td> <td>150</td> </tr> <tr> <td>216 960</td> <td>200</td> </tr> <tr> <td>Above 960</td> <td>500</td> </tr> </tbody> </table>	Frequency range (MHz)	Field Strength (uV/m)	30 – 88	100	88 – 216	150	216 960	200	Above 960	500	☒
Frequency range (MHz)	Field Strength (uV/m)												
30 – 88	100												
88 – 216	150												
216 960	200												
Above 960	500												
47CFR§22.917	b)	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													
Procedure		<ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. 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: <ol style="list-style-type: none"> Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. A Quasi-peak measurement was then made for that frequency point. 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 CIPHER at 10m chamber.

Radiated Emission Test Results (Below 1GHz)

Test specification	below 1GHz			Result	Pass
Environmental Conditions:	Temp (°C):	22			
	Humidity (%)	47			
	Atmospheric (mbar):	1020			
Mains Power:	33VDC				
Tested by:	Cipher				
Test Date:	02/28/2018				
Remarks:	Zigbee 2440 MHz + LTE band 2 Worst case limit was used for testing.				



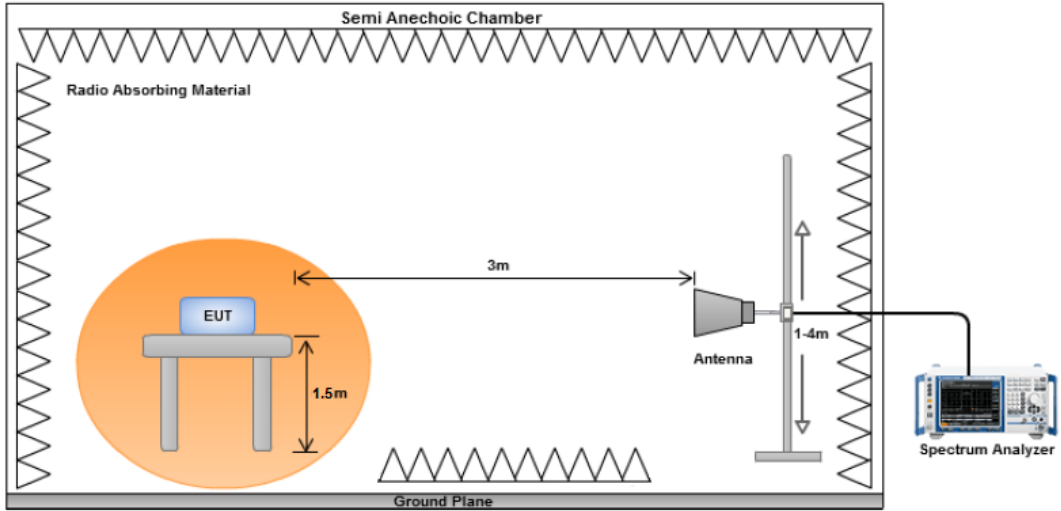
Quasi Max Measurement

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
30.01	17.26	10	-12.88	14.38	Quasi Max	H	128	244	40	-25.62	Pass
38.33	14.48	10	-19.99	4.49	Quasi Max	V	257	48	40	-35.51	Pass
958.76	16.34	10	-13.58	12.76	Quasi Max	H	319	154	46	-33.24	Pass
775.48	15.58	10	-14.73	10.86	Quasi Max	H	335	357	46	-35.15	Pass
471.50	13.49	10	-18.91	4.58	Quasi Max	H	219	137	46	-41.42	Pass
30.01	17.26	10	-12.88	14.38	Quasi Max	H	128	244	40	-25.62	Pass

Note: Both horizontal and vertical polarities were investigated. The results above show only the worst case.

10.8 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 <input type="checkbox"/> 20 dB down <input checked="" type="checkbox"/> 30 dB down	<input checked="" type="checkbox"/>
	b)	or restricted band, emission must also comply with the radiated emission limits specified in 15.209	<input checked="" type="checkbox"/>
47CFR§22.917	b)	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.	<input checked="" type="checkbox"/>
Test Setup			
Procedure	<ol style="list-style-type: none"> The EUT was switched on and allowed to warm up to its normal operating condition. 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: <ol style="list-style-type: none"> Vertical or horizontal polarisation (whichever gave the higher emission level over a full rotation of the EUT) was chosen. The EUT was then rotated to the direction that gave the maximum emission. Finally, the antenna height was adjusted to the height that gave the maximum emission. An average measurement was then made for that frequency point. 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 26GHz. Both horizontal and vertical polarities were investigated. The results show only the worst case.		
Result	<input checked="" type="checkbox"/> Pass <input type="checkbox"/> Fail		

Test Data Yes (See below) N/A
Test Plot Yes (See below) N/A

Test report No.	FCC IC_RF_SL18021901-XIR-001
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Test was done by Cipher Chu at 10m chamber.

Radiated Emission Test Results (Above 1GHz)

Zigbee – 2405MHz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
9622.87	38.91	5.58	0.55	45.04	Peak Max	H	175	339	74	-28.96	Pass
4809.19	38.76	4.11	-0.93	41.94	Peak Max	V	99	93	74	-32.06	Pass
7213.01	38.51	5.15	-0.45	43.21	Peak Max	H	154	18	74	-30.79	Pass
9622.87	26.47	5.58	0.55	32.6	Average Max	H	175	339	54	-21.4	Pass
4809.19	26.17	4.11	-0.93	29.35	Average Max	V	99	93	54	-24.65	Pass
7213.01	26.19	5.15	-0.45	30.89	Average Max	H	154	18	54	-23.11	Pass

Zigbee – 2440MHz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
7320.35	39.63	5.15	-0.49	44.29	Peak Max	H	168	92	74	-29.71	Pass
9760.955	39	5.5	0.81	45.31	Peak Max	V	99	267	74	-28.69	Pass
4880.88	39.84	4.18	-1	43.02	Peak Max	V	174	28	74	-30.98	Pass
7320.35	26.06	5.15	-0.49	30.73	Average Max	V	99	107	54	-23.28	Pass
9760.955	26.59	5.5	0.81	32.89	Average Max	H	114	314	54	-21.11	Pass
4880.88	26.55	4.18	-1	29.73	Average Max	V	174	28	54	-24.27	Pass

Zigbee – 2475MHz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
7425.905	39.03	5.14	-0.53	43.64	Peak Max	H	160	189	74	-30.36	Pass
9900.15	39.33	5.79	1.18	46.3	Peak Max	V	113	187	74	-27.7	Pass
4950.768	39.15	4.25	-1.06	42.34	Peak Max	H	217	53	74	-31.66	Pass
7425.905	26.25	5.14	-0.53	30.86	Average Max	H	160	189	54	-23.15	Pass
9900.15	26.88	5.79	1.18	33.84	Average Max	V	113	187	54	-20.16	Pass
4950.768	26.4	4.25	-1.06	29.59	Average Max	V	171	249	54	-24.41	Pass

















Zigbee 2440MHz and LTE Co-Location:








Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol (V/H)	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
17385.77	38.8	8.04	10.93	57.77	Peak Max	V	216	346	74	-16.23	Pass
17385.77	26.37	8.04	10.93	45.35	Average Max	V	216	346	54	-8.66	Pass
4880.15	40.09	4.2	-2.15	42.15	Peak Max	V	160	43	74	-23.85	Pass
4880.15	27.65	4.2	-2.15	29.71	Average Max	V	160	43	54	-24.29	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Radiated Emissions						
Keysight EXA 44GHz Spectrum Analyzer	N9010A	MY51440112	11/02/2017	1 Year	11/02/2018	<input checked="" type="checkbox"/>
Pre-Amplifier (1-40GHz)	SAS-474	579	05/04/2017	1 Year	05/04/2018	<input checked="" type="checkbox"/>
Preamplifier (100KHz-7GHz)	LPA-6-30	11170602	02/09/2018	1 Year	02/09/2019	<input checked="" type="checkbox"/>
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	01/13/2018	1 Year	01/13/2019	<input checked="" type="checkbox"/>
Horn Antenna (1-26.5GHz)	3115	10SL0059	08/11/2017	1 Year	08/11/2018	<input checked="" type="checkbox"/>

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		<p>Radio: A1. Terminal equipment for purpose of calling</p> <p>Telecom: B1. Specified radio equipment specified in Article 38-2, Paragraph 1, Item 1 of the Radio Law</p>
Korea CAB Accreditation		<p>EMI: KCC Notice 2008-39, RRL Notice 2008-3: CA Procedures for EMI KN22: Test Method for EMI</p> <p>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</p>
		<p>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</p> <p>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</p>
Taiwan NCC CAB Recognition		LP0002, PSTN01, ADSL01, ID0002, IS6100, CNS14336, PLMN07, PLMN01, PLMN08
Taiwan BSMI CAB Recognition		CNS 13438
Japan VCCI		<p>R-3083: Radiation 3 meter site</p> <p>C-3421: Main Ports Conducted Interference Measurement</p> <p>T-1597: Telecommunication Ports Conducted Interference Measurement</p>
Australia CAB Recognition		<p>EMC: AS/NZS CISPR 11, AS/NZS CISPR 14.1, AS/NZS CISPR22, AS/NZS 61000.6.3, AS/NZS 61000.6.4</p>
		<p>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</p>
		<p>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</p>
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