RF TEST REPORT

SIEMIC
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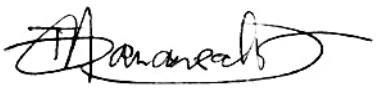
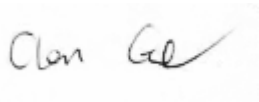
Report No.: FCC_IC_RF_SL16050301-LHS-002
Supersede Report No.: None

Applicant	**Pass & Seymour, Inc. d/b/a Legrand**
Product Name	**Radiant In-wall Scene Controller**
Model No.	**LC2303-XX - XX = color of housing (LC2303-WH White, LC2303-LA Light Almond, LC2303-NI Nickel)**
Test Standard	**47CFR15.247** **RSS-247 Issue 1.0, May 2015**
Test Method	**ANCI C63.4:2014** **RSS-Gen Issue 4.0, Nov 2014** **FCC Public Notice DA 00-705, 558074 D01 DTS Meas Guidance v03r04**
FCC ID	**YV8-204563**
IC ID	**9922A-204563**
Date of test	**05/16/2016 to 05/23/2016**
Issue Date	**06/06/2016**
Test Result	**Pass** **Fail**
Equipment complied with the specification	**[x]**
Equipment did not comply with the specification	**[ ]**

	
Teody Manansala	**Chen Ge**
Test Engineer	**Engineer Reviewer**

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

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

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 & R&TTE Directive
Japan	MIC (RCB 208)	RF, Telecom
Hong Kong	OFTA (US002)	RF, Telecom

CONTENTS

1 Report Revision History

Report No.	Report Version	Description	Issue Date
FCC_IC_RF_SL16050301-LHS-002	None	Original	06/06/2016

2 Executive Summary

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

Company: Pass & Seymour, Inc. d/b/a Legrand
Product: Radiant In-wall Scene Controller
Model: LC2303-XX - XX = color of housing (LC2303-WH White, LC2303-LA Light Almond, LC2303-NI Nickel)

against the current Stipulated Standards. The RF module (FCC ID: YV8-204563, IC ID: 9922A-204563) has demonstrated compliance with the Stipulated Standard listed on 1st page.

3 Customer information

Applicant Name	Pass & Seymour, Inc. d/b/a Legrand
Applicant Address	301 Fulling Mill Road, Suite G, Middletown, PA 17057
Manufacturer Name	Pass & Seymour, Inc. d/b/a Legrand
Manufacturer Address	301 Fulling Mill Road, Suite G, Middletown, PA 17057

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	Radiant In-wall Scene Controller
Model No.	LC2303-XX - XX = color of housing (LC2303-WH White, LC2303-LA Light Almond, LC2303-NI Nickel)
Host Model No.	LC2303-XX
Trade Name	Legrand
Serial No.	N/A
Input Power	120VAC, 60Hz
Power Adapter Manu/Model	N/A
Power Adapter SN	N/A
Product Hardware version	204563-01
Product Software version	1.0
Radio Hardware version	1.0
Radio Software version	1.0
Test software Version	1.0
Date of EUT received	05/13/2016
Equipment Class/ Category	DSSS
Port/Connectors	N/A
Remark	N/A

6.2 Radio Description

Spec for Radio -

Radio Type	UHF RFID
Operating Frequency	904.861-924.873 MHz
Modulation	FSK Synchronous Manchester Encoded(Hybrid Spread Spectrum)
Number of Channels	5
Antenna Type	Embedded antenna
Antenna Gain	2.56 dBi
Antenna Connector Type	Attached to PCBA

6.3 EUT test modes/configuration Description

Test mode

Test Mode		Note
Test_mode_1	Transmitting continuously	-
Test_mode_2		-
Test_mode_3		-
Test_mode_4		-
Remark:		

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

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

7.2 Cabling Description

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

7.3 Test Software Description

Test Item	Software	Description
-	-	-

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Restricted Band of Operation	FCC	15.205	FCC	ANSI C63.4 – 2014 FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS 247	IC	-	
AC Conducted Emissions Voltage	FCC	15.207(a)	FCC	ANSI C63.4 – 2014	☒ Pass ☐ N/A
	IC	RSS247(5.5)	IC	RSS-Gen Issue 4.0, Nov 2014	

Test Item	Test standard		Test Method/Procedure		Pass / Fail
Channel Separation	FCC	15.247 (a)(1)	FCC	FCC Public Notice DA 00-705	☐ Pass ☒ N/A
	IC	RSS247 (5.3.1)	IC	-	
Occupied Bandwidth	FCC	15.247 (a)(1)	FCC	-	☒ Pass ☐ N/A
	IC	RSS Gen Issue4(4.6)	IC	-	
20 dB Bandwidth	FCC	15.247 (a)(2)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS247 (5.1.3)	IC	-	
Number of Hopping Channels	FCC	15.247 (a)(1)	FCC	-	☐ Pass ☒ N/A
	IC	RSS247 (5.3)	IC	-	
Band Edge and Radiated Spurious Emissions	FCC	15.247(d)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS247 (5.5)	IC	-	
Time of Occupancy	FCC	15.247 (a)(1)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS247 (5.3.1)	IC	-	
Output Power	FCC	15.247(b)	FCC	FCC Public Notice DA 00-705	☒ Pass ☐ N/A
	IC	RSS247 (5.4.1)	IC	-	
Receiver Spurious Emissions	FCC	15.247(d)	FCC	FCC Public Notice DA 00-705	☐ Pass ☒ N/A
	IC	RSS Gen Issue4(7.1)	IC	-	
Antenna Gain > 6 dBi	FCC	15.247(e)	FCC	-	☐ Pass ☒ N/A
	IC	RSS247 (5.4)	IC	-	
Power Spectral Density	FCC	15.247(e)	FCC	558074 D01 DTS Meas Guidance v03r04	☒ Pass ☐ N/A
	IC	RSS210(5.2.2)	IC	-	
Hybrid System Requirement	FCC	15.247(f)	FCC	FCC Public Notice DA 00-705	☐ Pass ☒ N/A
	IC	RSS247 (5.3)	IC	-	
Hopping Capability	FCC	15.247(g)	FCC	-	☐ Pass ☒ N/A
	IC	RSS247 (5.1)	IC	-	
Hopping Coordination Requirement	FCC	15.247(h)	FCC	-	☐ Pass ☒ N/A
	IC	RSS247(5.1)	IC	-	
RF Exposure requirement	FCC	15.247(i)	FCC	-	☐ Pass ☒ N/A
	IC	RSS Gen Issue4(3.2)	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. The EUT is a hybrid system that employ a combination of both frequency hopping and digital modulation techniques

9 Measurement Uncertainty

Emissions			
Test Item	**Frequency Range**	**Description**	**Uncertainty**
AC Conducted Emissions Voltage	150KHz – 30MHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2	±3.5dB
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)	+5.6dB/-4.5dB
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)	+4.3dB/-4.1dB

10 Measurements, Examination and Derived Results

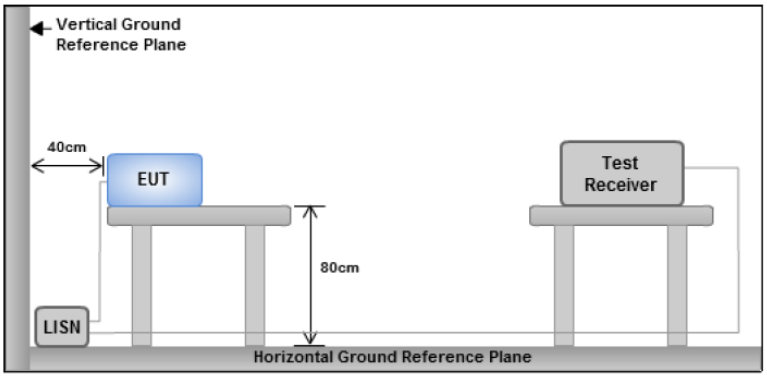
10.1 Antenna Requirement

Spec	Requirement	Applicable
§15.203	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. Antenna requirement must meet at least one of the following: a) Antenna must be permanently attached to the device. b) Antenna must use a unique type of connector to attach to the device. c) Device must be professionally installed. Installer shall be responsible for ensuring that the correct antenna is employed with the device.	☒
Remark	The antenna is integral to the PCB board permanently to the device which meets the requirement (See Internal Photographs submitted as another Exhibit).	
Result	☒ PASS ☐ FAIL	

10.2 Conducted Emissions

Conducted Emission Limit

Frequency ranges (MHz)	Limit (dBuV)	
	QP	Average
0.15 ~ 0.5	66 – 56	56 – 46
0.5 ~ 5	56	46
5 ~ 30	60	50

Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 µH/50 ohms line impedance stabilization network (LISN). The lower limit applies at the boundary between the frequency ranges.	☒
Test Setup	 Note: 1. Support units were connected to second LISN. 2. Both of LISNs (AMN) are 80 cm from EUT and at least 80 cm from other units and other metal planes		
Procedure	- The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m x 1m x 0.8m high, non-metallic table, as shown in Annex B. - The power supply for the EUT was fed through a 50Ω/50µH EUT LISN, connected to filtered mains. - The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable. - All other supporting equipment was powered separately from another main supply.		
Remark	EUT tested at 110VAC 60Hz		
Result	☒ Pass ☐ Fail		

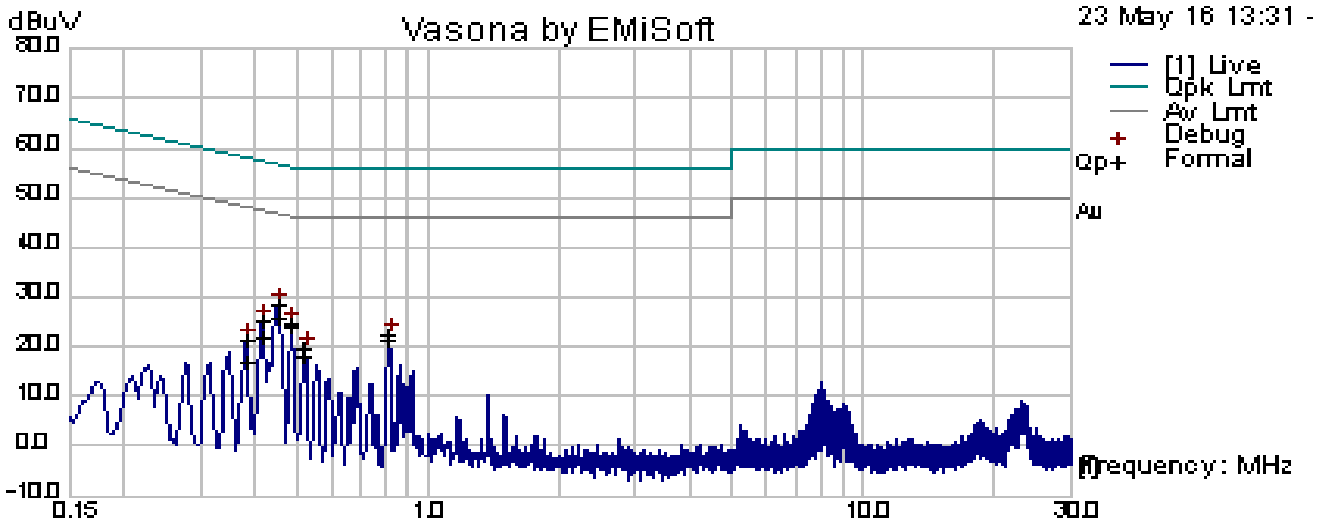
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Teody Manansala at Conducted Emission test site.

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21.5	Result:	☒ Pass ☐ Fail
	Humidity (%):	37		
	Atmospheric(mbar):	1028		
Mains Power:	110Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	05/23/2016			
Remarks	AC Line @ Live			

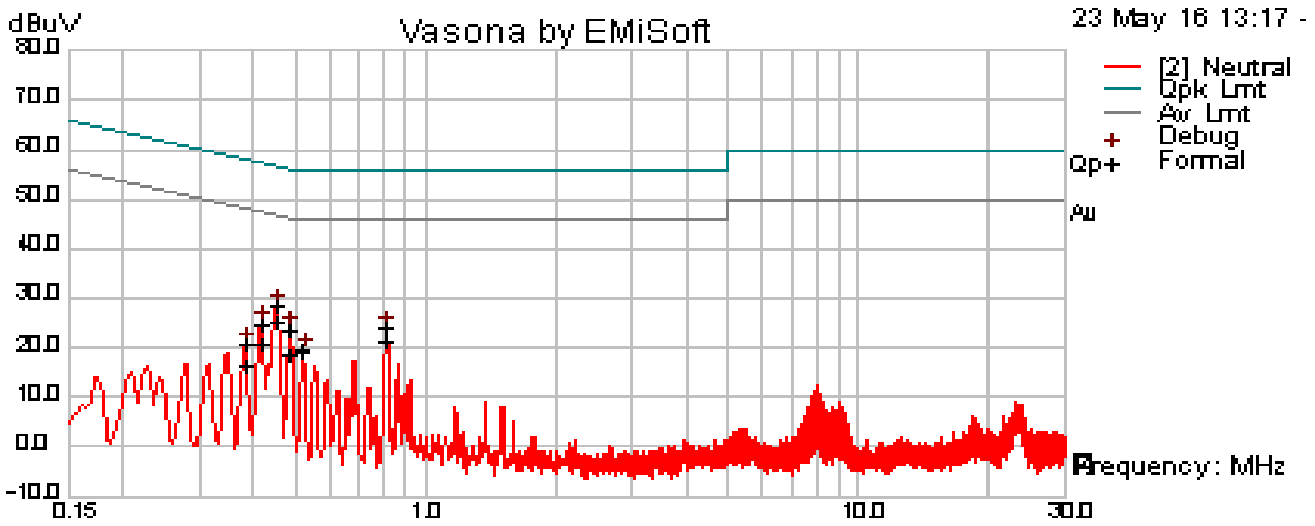


Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.45	17.92	10.01	0.71	28.65	Quasi Peak	Live	56.88	-28.24	Pass
0.49	13.64	10.01	0.69	24.33	Quasi Peak	Live	56.25	-31.92	Pass
0.42	14.75	10.01	0.74	25.50	Quasi Peak	Live	57.54	-32.04	Pass
0.81	12.14	10.01	0.60	22.75	Quasi Peak	Live	56.00	-33.25	Pass
0.52	9.18	10.01	0.67	19.86	Quasi Peak	Live	56.00	-36.14	Pass
0.38	10.56	10.01	0.77	21.33	Quasi Peak	Live	58.24	-36.91	Pass
0.45	15.10	10.01	0.71	25.82	Average	Live	46.88	-21.06	Pass
0.49	14.14	10.01	0.69	24.83	Average	Live	46.25	-21.42	Pass
0.42	11.19	10.01	0.74	21.94	Average	Live	47.54	-25.60	Pass
0.81	10.59	10.01	0.60	21.20	Average	Live	46.00	-24.80	Pass
0.52	7.67	10.01	0.67	18.35	Average	Live	46.00	-27.65	Pass
0.38	6.17	10.01	0.77	16.95	Average	Live	48.24	-31.30	Pass

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21.5	Result:	☒ Pass ☐ Fail
	Humidity (%):	37		
	Atmospheric(mbar):	1028		
Mains Power:	110Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	01/30/2015			
Remarks	Neutral			

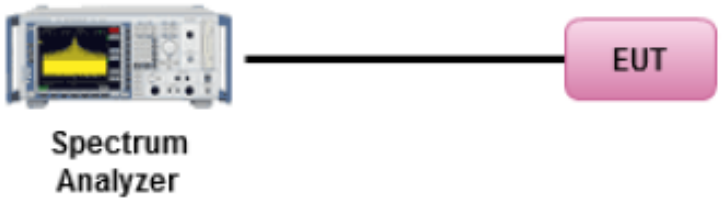


Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.45	17.65	10.01	0.71	28.37	Quasi Peak	Neutral	56.88	-28.51	Pass
0.81	10.83	10.01	0.60	21.44	Quasi Peak	Neutral	56.00	-34.56	Pass
0.48	12.92	10.01	0.69	23.62	Quasi Peak	Neutral	56.27	-32.65	Pass
0.42	13.89	10.01	0.74	24.64	Quasi Peak	Neutral	57.53	-32.89	Pass
0.52	8.38	10.01	0.67	19.06	Quasi Peak	Neutral	56.00	-36.94	Pass
0.38	9.96	10.01	0.77	20.74	Quasi Peak	Neutral	58.26	-37.51	Pass
0.45	14.58	10.01	0.71	25.30	Average	Neutral	46.88	-21.58	Pass
0.81	13.47	10.01	0.60	24.08	Average	Neutral	46.00	-21.92	Pass
0.48	8.16	10.01	0.69	18.86	Average	Neutral	46.27	-27.41	Pass
0.42	10.28	10.01	0.74	21.03	Average	Neutral	47.53	-26.50	Pass
0.52	9.38	10.01	0.67	20.06	Average	Neutral	46.00	-25.94	Pass
0.38	5.56	10.01	0.77	16.34	Average	Neutral	48.26	-31.92	Pass

10.3 20dB Bandwidth & 99% Bandwidth

Requirement(s):

Spec	Requirement	Applicable
47 CFR §15.247 (a) RSS-247 (5.1.3)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or 20 dB bandwidth of the hopping channel, whichever is greater.	☒
RSS Gen Issue 4.0 (4.6.1)	99% BW: For FCC reference only; required by IC.	☒
Test Setup		
Procedure	20dB Emission bandwidth measurement procedure 1. Set RBW ⩾ 1% of 20dB Bandwidth 2. Set the video bandwidth (VBW) ⩾ RBW. 3. Detector = Peak. 4. Trace mode = max hold. 5. Sweep = auto couple. 6. Allow the trace to stabilize. 7. 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. 99% Occupied bandwidth measurement procedure - Allow the trace to stabilize. - Use the spectrum analyser built-in measurement function to determine the 99% OBW. ○ Set RBW = close to 1% of the selected span as is ○ Set VBW = 3 x RBW ○ Detector = Peak ○ Trace mode = max hold ○ Sweep = auto couple - Capture the plot. - Repeat above steps for different test channel and other modulation type.	

Test Date	05/19/2016	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	24°C 46.3% 1019mbar
Remark	-			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

Test was done by Teody Manansala at RF test site.

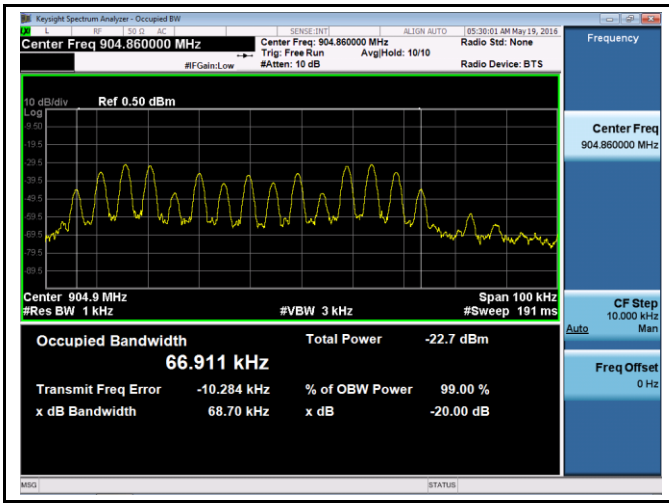
20dB Bandwidth Test Result

Type	Freq (MHz)	Test mode	CH	20dB Bandwidth (MHz)
20dB OBW	904.86	Con-TX	Low	0.06870
20dB OBW	918.86	Con-TX	Mid	0.06871
20dB OBW	924.87	Con-TX	High	0.06867

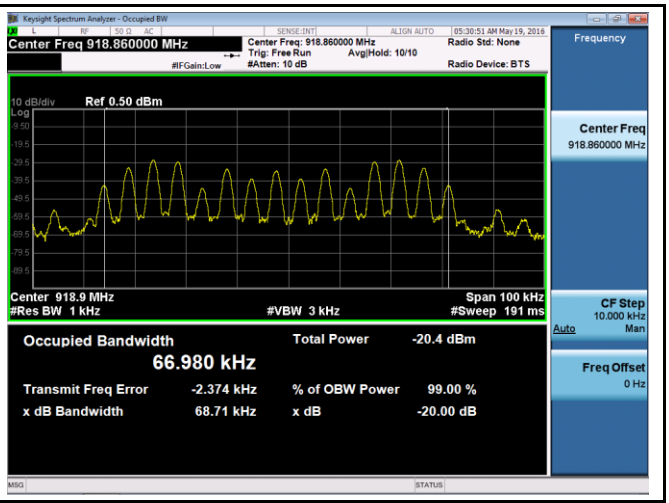
99% Bandwidth Test Result

Type	Freq (MHz)	Test mode	CH	99% Bandwidth (MHz)
99% OBW	904.861	Con-TX	Low	0.066911
99% OBW	918.869	Con-TX	Mid	0.066980
99% OBW	924.873	Con-TX	High	0.066945

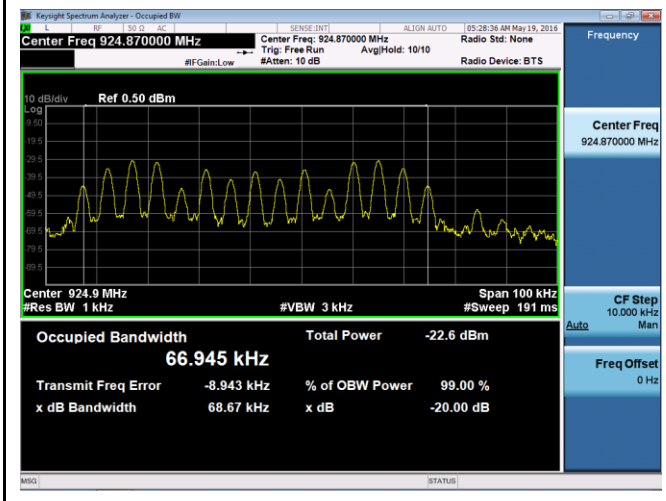
20 dB & 99% Test Plots



BW Low CH



BW Mid CH



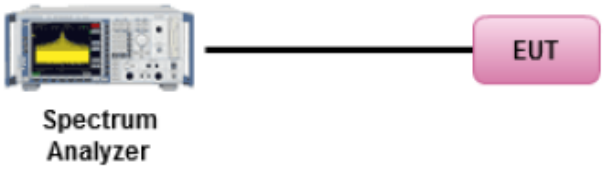
BW High CH

-

10.4 Number of Hopping Channel

Requirement(s):

Spec	Requirement	Applicable
47 CFR §15.247 RSS-247 (5.3)	For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 20 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The maximum allowed 20 dB bandwidth of the hopping channel is 500 kHz	☐

Test Setup			
Procedure	Number of hopping frequencies procedure 1. The EUT must have its hopping function enabled 2. Span = the frequency band of operation. 3. Resolution (or IF) Bandwidth (RBW) >= 1% of the span. 4. Video (or Average) Bandwidth (VBW) >= RBW. 5. Detector = peak. 6. Sweep time = auto couple. 7. Trace mode = max hold. 8. Allow trace to fully stabilize. 9. Save the plot		
Test Date	N/A	Environmental condition	Temperature N/A Relative Humidity N/A Atmospheric Pressure N/A
Remark	The EUT is hybrid system, this item is not applicable to EUT.		
Result	☐ Pass ☐ Fail		

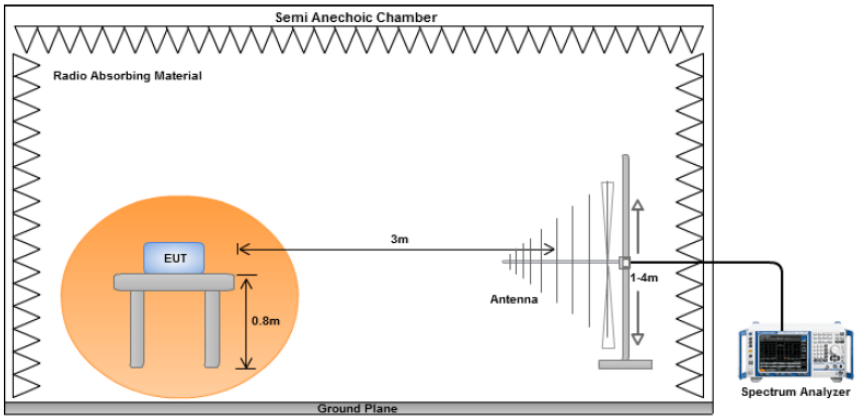
Test Data ☐ Yes ☒ N/A

Test Plot ☐ Yes ☒ N/A

10.5 Peak Output Power

Requirement(s):

Spec	Requirement	Applicable
47 CFR §15.247 (b) RSS-247 (5.4.1)	For all other frequency hopping systems in the 902-928 MHz band: 1 Watt. The power is converted from watt to dBm, therefore, 1 watt = 30 dBm.	☒

Test Setup				
Procedure	Maximum output power measurement procedure - Span = approximately 5 times the 20 dB bandwidth, centered on a hopping channel. - RBW > 1% of the 20 dB bandwidth of the emission being measured; - VBW >= RBW. - Detector = peak. - Sweep time = auto couple. - Trace mode = max hold. - Allow trace to fully stabilize. - Use the marker-to-peak function to set the marker to the peak of the emission. The indicated level is the peak output power.			
Test Date	05/23/2016	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	22.1°C 45.5% 1019mbar
Remark	EIRP = Measured Field Strength – 95.23 (@ 3m distance) Measured Power = EIRP – Ant Gain			
Result	☒ Pass ☐ Fail			

Test Data ☒ Yes ☐ N/A

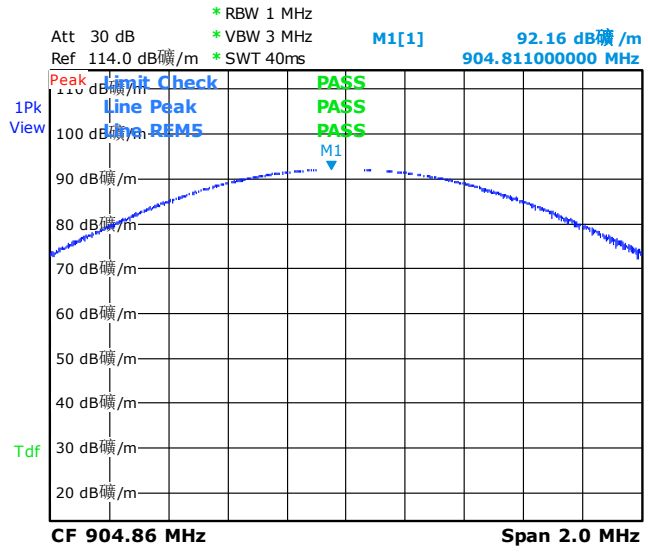
Test Plot ☒ Yes ☐ N/A

Test was done by Teody Manansala at 10 meter Chamber.

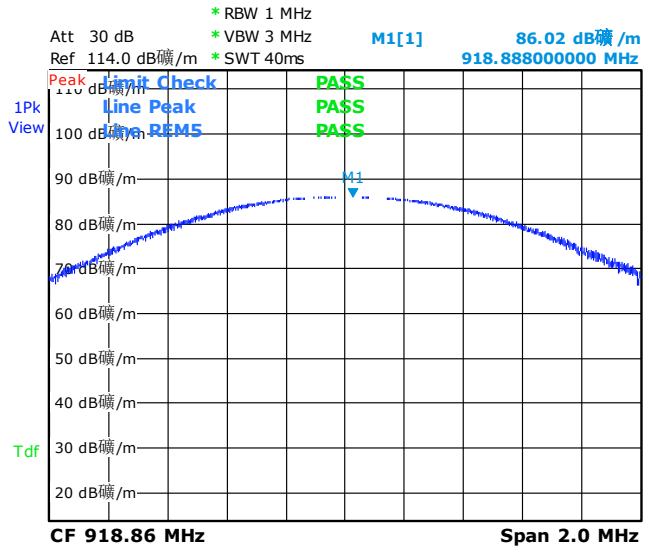
Output Power Test Result

Type	Freq (MHz)	Test mode	CH	Measured field strength@3m (dBuV/m)	Antenna Gain (dBi)	Converted Conducted Power (dBm)	Limit (dBm)	Result
Output power	904.861	Cont-TX	Low	92.16	2.56	-5.63	30	Pass
Output power	918.869	Cont-TX	Mid	86.02	2.56	-11.77	30	Pass
Output power	924.873	Cont-TX	High	84.86	2.56	-13.29	30	Pass

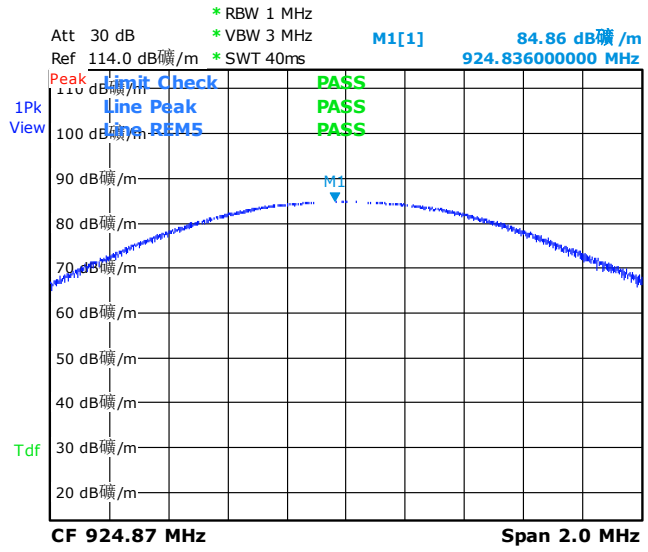
Test Plots



Output power - Low CH



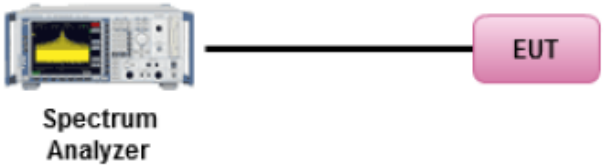
Output power - Mid CH



Output power - High CH

10.6 Channel Separation

Requirement(s):

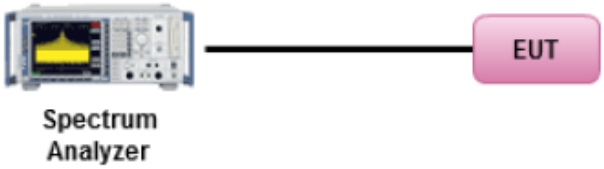
Spec	Requirement			Applicable
47 CFR §15.247 (a)(1) RSS-247 (5.3.1)	Frequency hopping systems shall have hopping channel carrier frequencies separated by a minimum of 25 kHz or the 20 dB bandwidth of the hopping channel, whichever is greater.			☒
Test Setup				
Procedure	Channel Separation procedure 1. The EUT must have its hopping function enabled. 2. Span = wide enough to capture the peaks of two adjacent channels 3. Resolution (or IF) Bandwidth (RBW) >= 1% of the span 4. Video (or Average) Bandwidth (VBW) >= RBW. 5. Detector = Peak. 6. Trace mode = max hold. 7. Use the marker-delta function to determine the separation between the peaks of the adjacent channels.			
Test Date	N/A	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 45% 1019mbar
Remark	EUT belongs to hybrid system. There is not hop channel separation restriction on hybrid system. The results here are for reference.			
Result	☐ Pass ☐ Fail ☒ N/A			

Test Data ☐ Yes ☒ N/A

Test Plot ☐ Yes ☒ N/A

10.7 Time of Occupancy

Requirement(s):

Spec	Requirement	Applicable
47 CFR §15.247 RSS-247 (5.3.1)	For frequency hopping systems operating in the 902–928 MHz band: if the 20 dB bandwidth of the hopping channel is less than 250 kHz, the system shall use at least 50 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 2 second period; if the 20 dB bandwidth of the hopping channel is 250 kHz or greater, the system shall use at least 25 hopping frequencies and the average time of occupancy on any frequency shall not be greater than 0.4 seconds within a 10 second period. The frequency hopping operation of the hybrid system, with the direct sequence or digital modulation operation turned off, shall have an average time of occupancy on any frequency not to exceed 0.4 seconds within a time period in seconds equal to the number of hopping frequencies employed multiplied by 0.4.	☒
Test Setup		
Procedure	Channel Separation procedure 1. The EUT must have its hopping function enabled. 2. Span = zero span 3. centered on a hopping channel 4. RBW = 1 MHz; VBW >= RBW 5. Sweep = as necessary to capture the entire dwell time per hopping channel. 6. Detector = Peak. 7. Trace mode = max hold. 8. If possible, use the marker-delta function to determine the dwell time. If this value varies with different modes of operation (e.g., data rate, modulation format, etc.), repeat this test for each variation.	
Test Date	03/16/2016	Environmental condition: Temperature 23°C; Relative Humidity 45%; Atmospheric Pressure 1019mbar
Remark	EUT belongs to hybrid system. We used 2s as the repetition observation time, which is equal to the number of hopping frequencies employed multiplied by 0.4. Dwell Time equals to the number of repetition times in each channel in 2 seconds multiply by the time of occupancy in each hopping frequency.	
Result	☒ Pass ☐ Fail	

Test Data ☒ Yes ☐ N/A

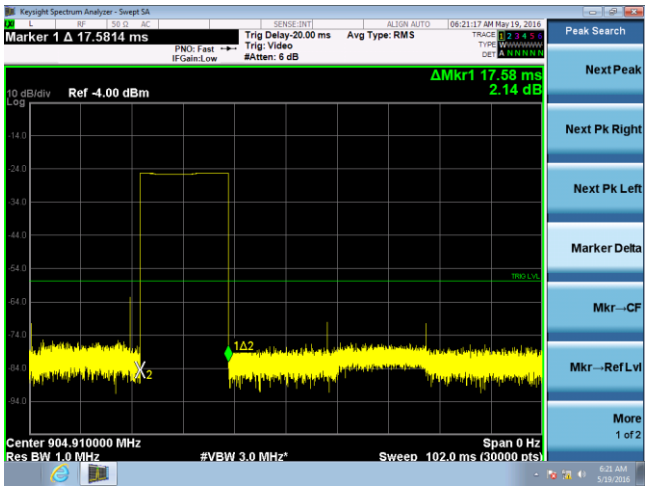
Test Plot ☒ Yes ☐ N/A

Test was done by Teody Manansala at RF test site.

Dwell Time Test Result

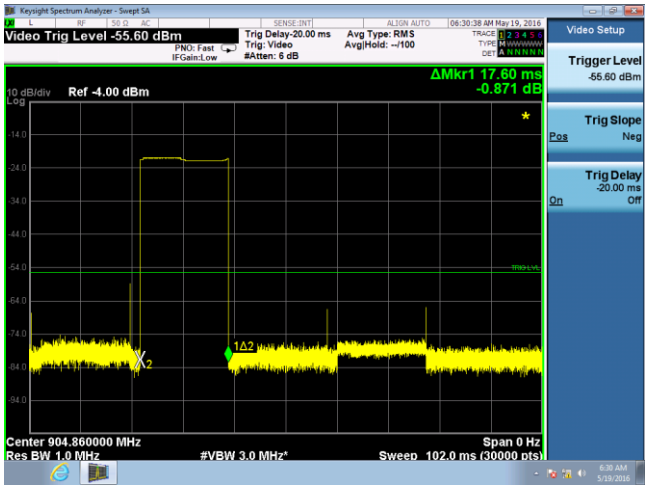
Index	Mode	Frequency (MHz)	Type	Measurement	Calculated Dwell Time(Sec)	Limit (Sec)
1	TX	904.861	Single Pulse time (Sec)	0.01758	0.1217	0.4
2	TX	904.861	Cycle time(Sec)	0.2890		
3	TX	918.869	Single Pulse time (Sec)	0.01760	0.1322	0.4
4	TX	918.869	Cycle time(Sec)	0.2662		
5	TX	924.873	Single Pulse time (Sec)	0.01760	0.1199	0.4
6	TX	924.873	Cycle time(Sec)	0.2937		

Test Plots

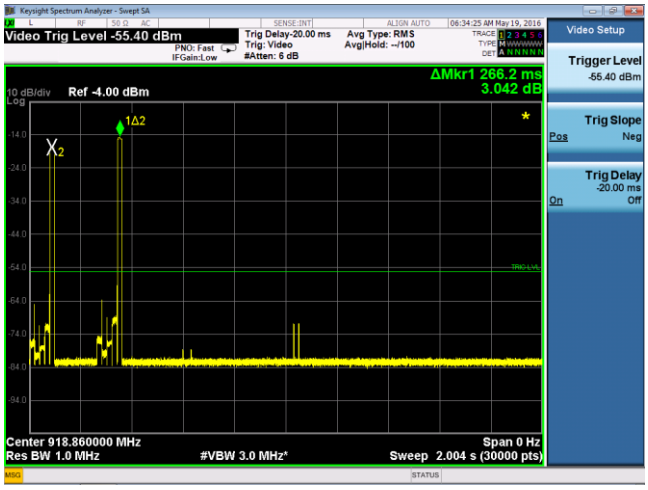


Low Channel Single Pulse Time

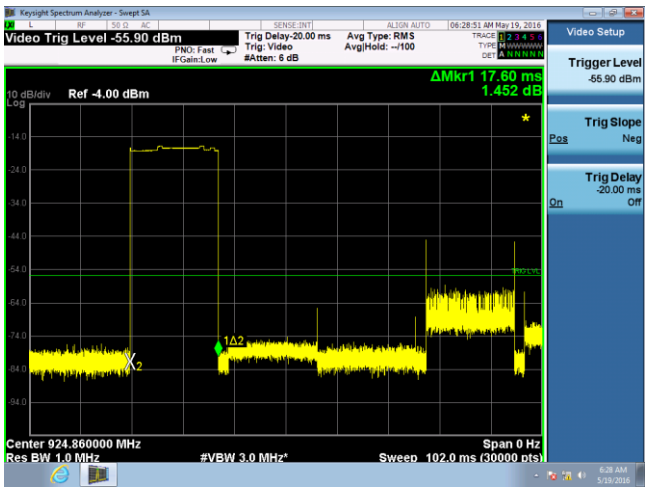
Low Channel Cycle Time



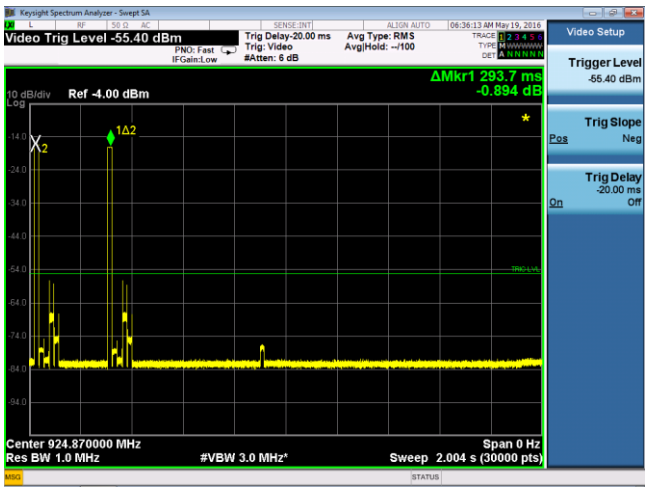
Mid Channel Single Pulse Time



Mid Channel Cycle Time



High Channel Single Pulse Time

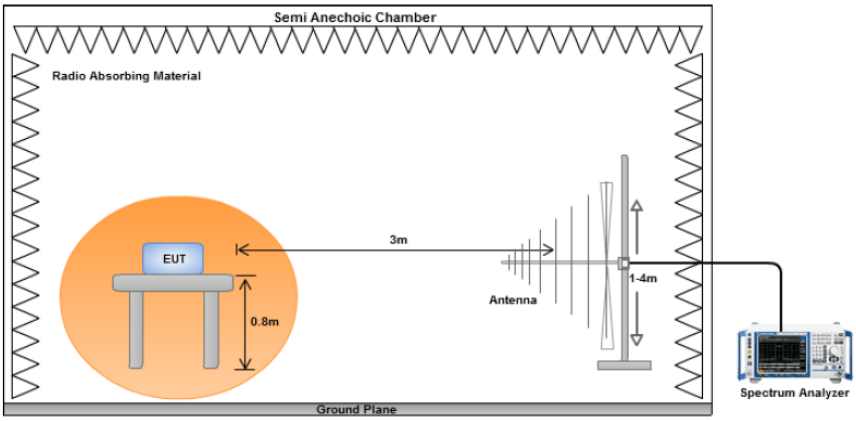


High Channel Cycle Time

10.8 Peak Spectral Density

Requirement(s):

Spec	Requirement	Applicable
47 CFR §15.247 RSS-247 (5.2.2)	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	☒

Test Setup			
Procedure	Peak spectral density measurement procedure - Set analyzer center frequency to DTS channel center frequency. - Set the span to 1.5 times the DTS bandwidth. - Set the RBW to: 3 kHz ≤ RBW ≤ 100 kHz. - Set the VBW ≥ 3 x 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	05/23/2016	Environmental condition	Temperature 23°C Relative Humidity 45% Atmospheric Pressure 1019mbar
Remark	EIRP density = Measured Field Strength – 95.23 (@ 3m distance) Measured PSD = EIRP density – Ant Gain		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes (See below) ☐ N/A

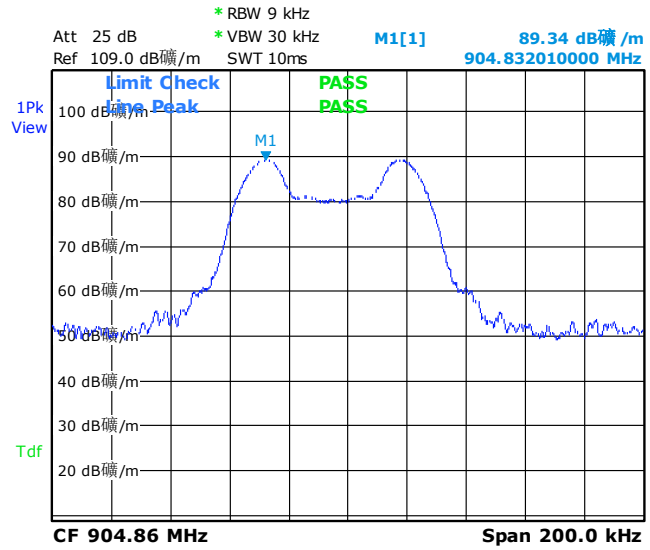
Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Teody Manansala at 10 meter Chamber.

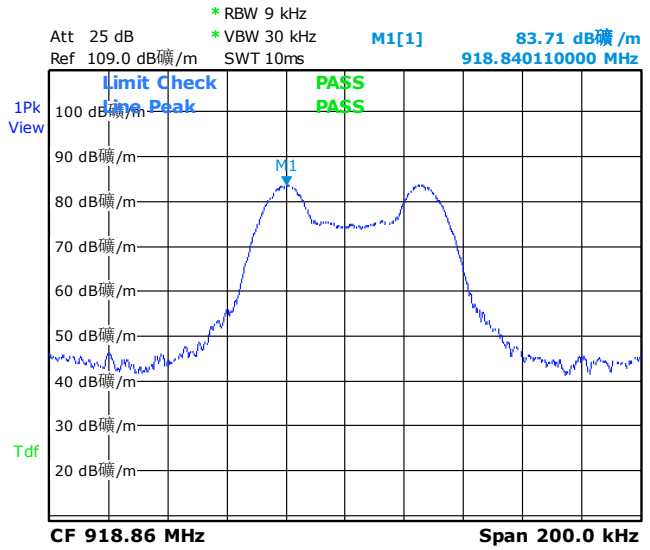
PSD Test Data

Type	Freq (MHz)	Test mode	CH	Measured field strength@3m (dBuV/m)	Antenna Gain (dBi)	Converted PSD (dBm/3KHz)	Limit (dBm/3 kHz)	Result
Maximum PSD	904.861	Cont-TX	Low	89.34	2.56	-8.45	8	Pass
Maximum PSD	918.869	Cont-TX	Mid	83.71	2.56	-14.08	8	Pass
Maximum PSD	924.873	Cont-TX	High	82.90	2.56	-14.89	8	Pass

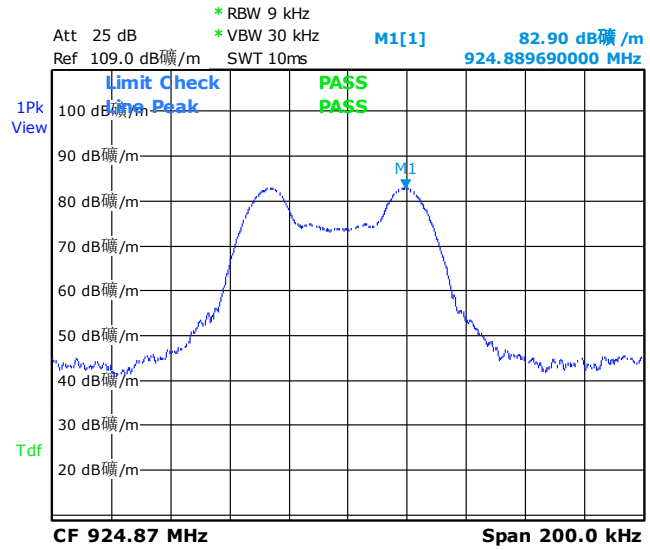
Test Plots



Output power - Low CH



Output power - Mid CH

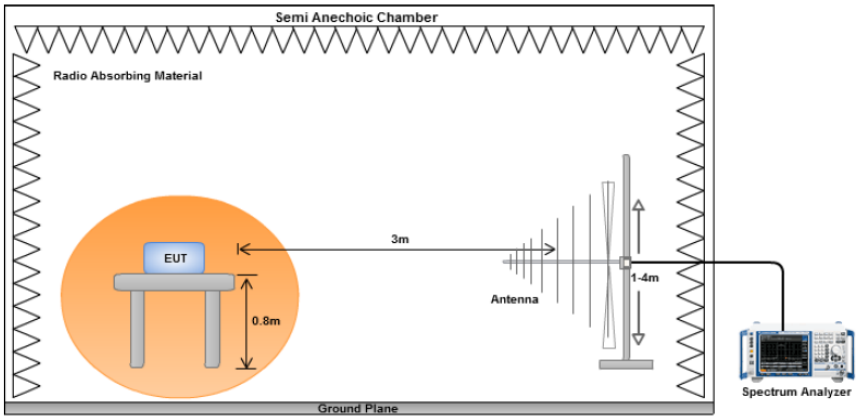


Output power - High CH

10.9 Band Edge

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.247(d), RSS-247 Issue 1.0, May 2015	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 ☒ 20 dB down ☐ 30 dB down	☒

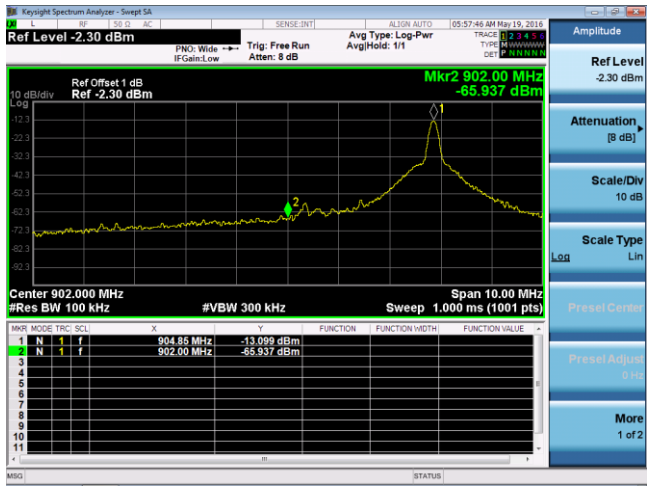
Test Setup				
Test Procedure	558074 D01 DTS Meas Guidance v03r04 Band Edge measurement procedure 1. Set the EUT to maximum power setting and enable the EUT transmit continuously. 2. Band edge emissions must be at least 20 dB down from the highest emission level within the authorized band as a measured. The attenuation shall be be 30 dB instead of 20 dB when RMS 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	05/19/2016	Environmental condition	Temperature Relative Humidity Atmospheric Pressure	23°C 46% 1020mbar
Remark	None			
Result	☒ Pass ☐ Fail			

Test Data ☐ Yes ☒ N/A

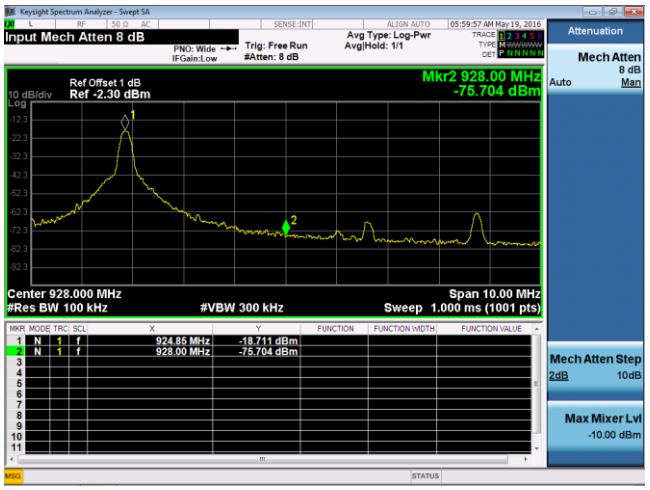
Test Plot ☒ Yes ☐ N/A

Test was done by Teody Manansala at 10 meter Chamber.

Test Plots



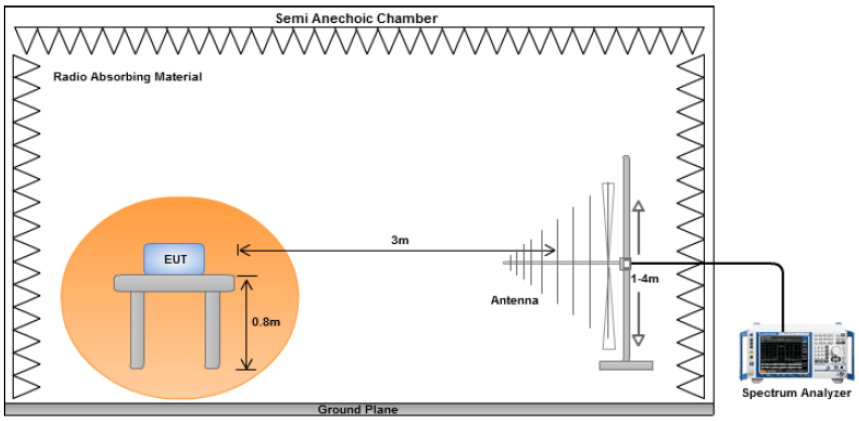
Band Edge-Low CH



Band Edge-High CH

10.10 Radiated Emissions below 1GHz

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>47CFR§15.247(d), RSS247(5.5)</td><td>a)</td><td>Except as provided elsewhere in this subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table: The tighter limit applies at the band edges
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th><th>Measurement Distance (m)</th></tr>
<tr><td>30 – 88</td><td>100</td><td>3</td></tr>
<tr><td>88 – 216</td><td>150</td><td>3</td></tr>
<tr><td>216 960</td><td>200</td><td>3</td></tr>
<tr><td>Above 960</td><td>500</td><td>3</td></tr>
</table></td><td>☐</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 
</td></tr>
<tr><td>Procedure</td><td colspan="3">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.</td></tr>
<tr><td>Remark</td><td colspan="3">Different EUT orientations were evaluated. Only the worst case is presented in this report.</td></tr>
<tr><td>Result</td><td colspan="3">☒ Pass ☐ Fail</td></tr>
</table>

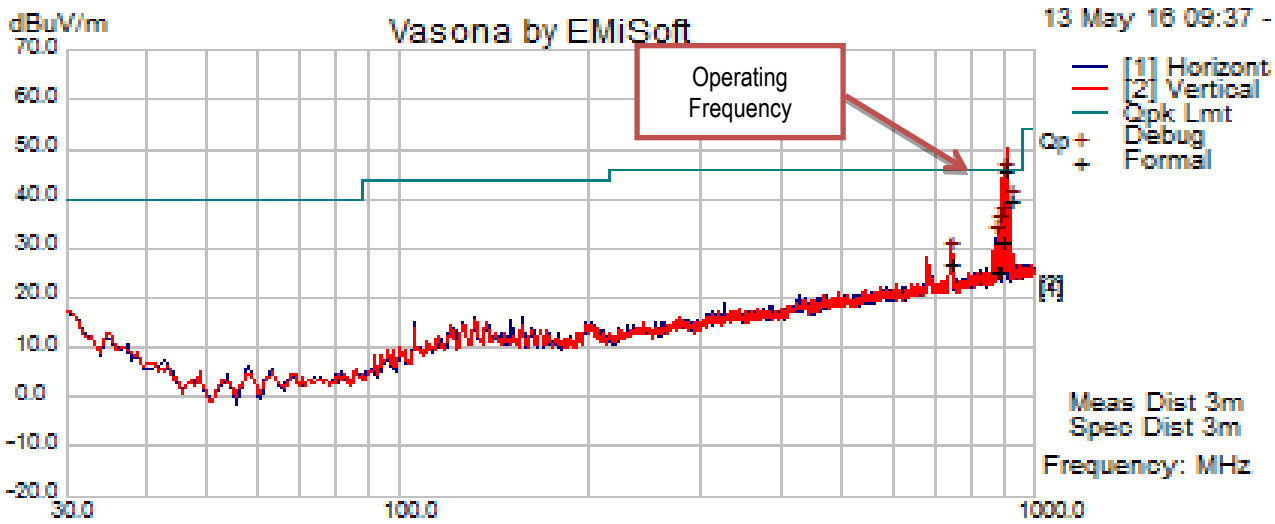
Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Test was done by Teody Manansala at 10 meter Chamber.

Radiated Emission Test Results (Below 1GHz)

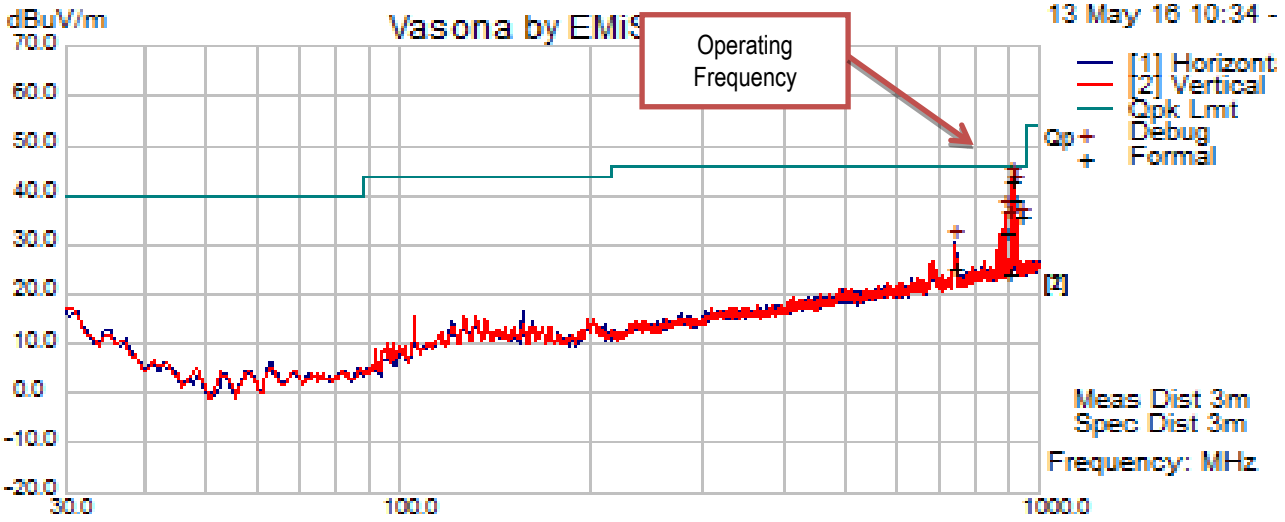
Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	20		
	Humidity (%)	38		
	Atmospheric (mbar):	1019		
Mains Power:	120VAC,60Hz			
Tested by:	Teody Manansala			
Test Date:	05/13/2016			
Remarks:	Continuous Tx at 904.86MHz			



30MHz – 1000MHz at 3 meters

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
891.85	57.55	4.71	-16.36	45.90	Quasi Max	V	143.00	215.00	46.02	-0.12	Pass
917.85	50.98	4.86	-16.04	39.81	Quasi Max	V	107.00	229.00	46.02	-6.21	Pass
890.21	42.95	4.72	-16.43	31.23	Quasi Max	H	183.00	291.00	46.02	-14.79	Pass
879.19	37.03	4.76	-16.57	25.22	Quasi Max	V	102.00	326.00	46.02	-20.80	Pass
867.82	37.24	4.71	-16.71	25.24	Quasi Max	H	180.00	89.00	46.02	-20.78	Pass
739.17	41.01	4.23	-18.37	26.86	Quasi Max	V	119.00	287.00	46.02	-19.16	Pass

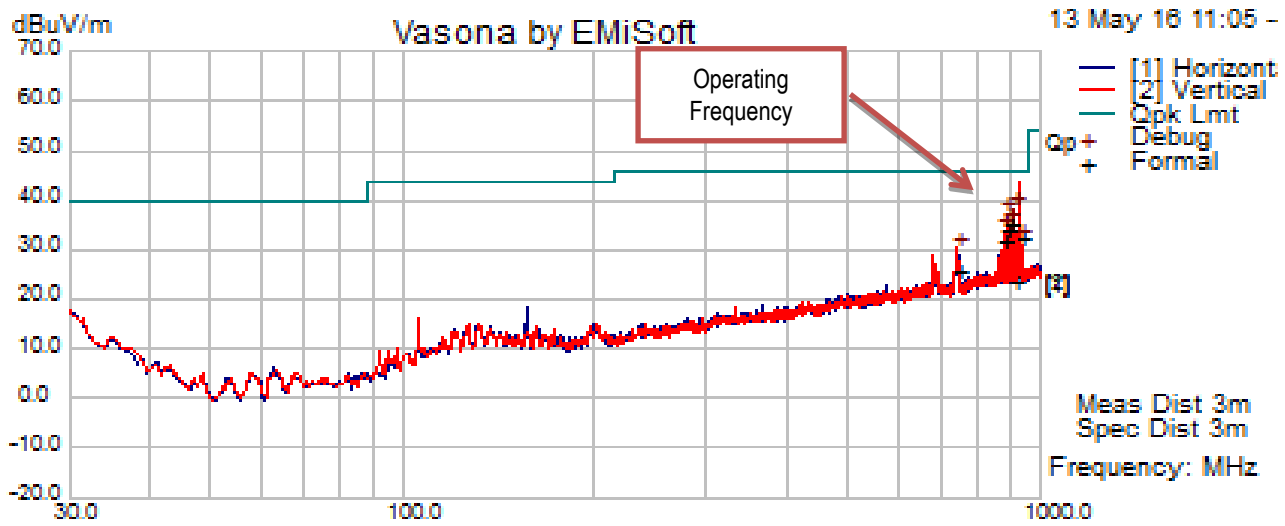
Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	21		
	Humidity (%)	40		
	Atmospheric (mbar):	1019		
Mains Power:	120VAC,60Hz			
Tested by:	Teody Manansala			
Test Date:	05/13/2016			
Remarks:	Continuous Tx at 918.86MHz			



30MHz – 1000MHz at 3 meters

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
905.87	54.40	4.81	-16.07	43.14	Quasi Max	V	104.00	218.00	46.02	-2.88	Pass
919.74	49.95	4.85	-16.01	38.79	Quasi Max	V	175.00	231.00	46.02	-7.23	Pass
890.20	44.23	4.72	-16.44	32.51	Quasi Max	V	252.00	125.00	46.02	-13.51	Pass
931.86	46.51	4.78	-15.83	35.47	Quasi Max	V	112.00	186.00	46.02	-10.55	Pass
893.17	35.80	4.69	-16.30	24.20	Quasi Max	V	132.00	225.00	46.02	-21.82	Pass
738.63	39.11	4.23	-18.38	24.97	Quasi Max	H	100.00	322.00	46.02	-21.05	Pass

Test specification	below 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	20		
	Humidity (%)	38		
	Atmospheric (mbar):	1019		
Mains Power:	120VAC,60Hz			
Tested by:	Teody Manansala			
Test Date:	05/13/2016			
Remarks:	Continuous Tx at 924.87MHz			

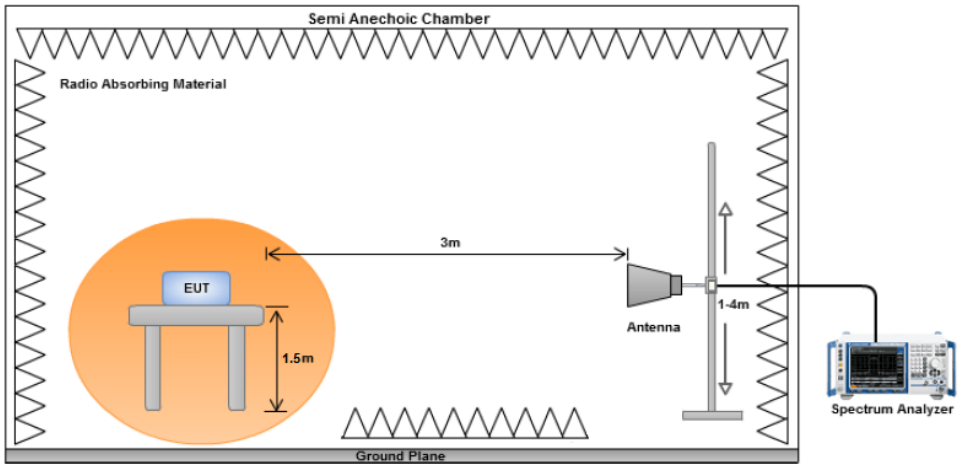


30MHz – 1000MHz at 3 meters

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
912.15	34.64	4.85	-16.11	23.37	Quasi Max	V	352.00	351.00	46.02	-22.65	Pass
890.21	45.66	4.72	-16.43	33.94	Quasi Max	H	360.00	161.00	46.02	-12.08	Pass
898.87	46.54	4.77	-16.03	35.28	Quasi Max	V	102.00	223.00	46.02	-10.74	Pass
879.61	43.93	4.77	-16.57	32.13	Quasi Max	H	400.00	258.00	46.02	-13.89	Pass
937.86	43.32	4.85	-15.78	32.39	Quasi Max	V	101.00	175.00	46.02	-13.63	Pass
740.81	40.07	4.24	-18.36	25.94	Quasi Max	V	182.00	256.00	46.02	-20.08	Pass

10.11 Radiated Spurious Emissions above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
47CFR§15.247(d), RSS247 (5.5)	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 2.8	☒
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 tested up to 10GHz inside of four different hosts at Low, Mid and High channels	
Result		☒ Pass ☐ Fail	

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test was done by Teody Manansala at 3 meter Chamber.

Radiated Emission Test Results (Above 1GHz)

Test specification	Above 1GHz		Result	Pass
Environmental Conditions:	Temp (°C):	22		
	Humidity (%)	40		
	Atmospheric (mbar):	1019		
Mains Power:	120VAC,60Hz			
Tested by:	Teody Manansala			
Test Date:	06/06/2016			
Remarks:	The EUT was tested inside the 3M chamber at Low, Mid and High channels			

Continuous Tx at 904.86MHz

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
2708.93	49.12	6.20	-22.64	32.68	Peak Max	V	157.00	97.00	74.00	-41.32	Pass
3625.42	44.54	6.79	-20.99	30.33	Peak Max	V	111.00	118.00	74.00	-43.67	Pass
5429.31	62.44	6.94	-16.97	52.42	Peak Max	V	126.00	28.00	74.00	-21.58	Pass
7238.81	50.95	7.36	-11.55	46.75	Peak Max	V	244.00	360.00	74.00	-27.25	Pass
1809.50	72.33	4.76	-29.00	48.09	Peak Max	V	126.00	34.00	74.00	-25.91	Pass
17711.48	34.86	9.44	-3.12	41.18	Peak Max	V	215.00	359.00	74.00	-32.82	Pass
2708.93	37.26	6.20	-22.64	20.82	Average Max	V	157.00	97.00	54.00	-33.18	Pass
3625.42	32.73	6.79	-20.99	18.53	Average Max	V	111.00	118.00	54.00	-35.48	Pass
5429.31	60.17	6.94	-16.97	50.15	Average Max	V	126.00	28.00	54.00	-3.85	Pass
7238.81	47.34	7.36	-11.55	43.14	Average Max	V	244.00	360.00	54.00	-10.86	Pass
1809.50	71.89	4.76	-29.00	47.65	Average Max	V	126.00	34.00	54.00	-6.35	Pass
17711.48	23.14	9.44	-3.12	29.46	Average Max	V	215.00	359.00	54.00	-24.54	Pass

Continuous Tx at 918.86MHz

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
5513.66	65.97	6.93	-17.04	55.86	Peak Max	H	214.00	30.00	74.00	-18.14	Pass
3675.64	63.22	6.79	-20.72	49.28	Peak Max	V	138.00	39.00	74.00	-24.72	Pass
17955.53	37.29	9.46	-3.18	43.58	Peak Max	V	199.00	359.00	74.00	-30.43	Pass
12357.01	36.11	8.91	-7.22	37.80	Peak Max	V	219.00	161.00	74.00	-36.20	Pass
8522.61	44.71	7.58	-10.98	41.30	Peak Max	V	242.00	232.00	74.00	-32.70	Pass
7174.40	43.37	7.37	-11.73	39.01	Peak Max	H	126.00	359.00	74.00	-34.99	Pass
5513.66	59.62	6.93	-17.04	49.51	Average Max	H	214.00	30.00	54.00	-4.49	Pass
3675.64	60.65	6.79	-20.72	46.72	Average Max	V	138.00	39.00	54.00	-7.28	Pass
17955.53	24.85	9.46	-3.18	31.14	Average Max	V	199.00	359.00	54.00	-22.86	Pass
12357.01	24.73	8.91	-7.22	26.42	Average Max	V	219.00	161.00	54.00	-27.58	Pass
8522.61	33.09	7.58	-10.98	29.68	Average Max	V	242.00	232.00	54.00	-24.32	Pass
7174.40	31.38	7.37	-11.73	27.02	Average Max	H	126.00	359.00	54.00	-26.98	Pass

Continuous Tx at 924.87MHz

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
5549.06	62.67	6.94	-17.01	52.61	Peak Max	V	242.00	51.00	74.00	-21.39	Pass
3699.31	52.46	6.79	-20.60	38.66	Peak Max	H	134.00	359.00	74.00	-35.35	Pass
8619.04	41.93	7.60	-10.85	38.68	Peak Max	V	187.00	359.00	74.00	-35.32	Pass
2774.58	57.31	6.27	-22.68	40.91	Peak Max	V	243.00	18.00	74.00	-33.09	Pass
17723.15	35.39	9.44	-3.17	41.66	Peak Max	H	244.00	360.00	74.00	-32.35	Pass
7188.28	42.54	7.37	-11.65	38.25	Peak Max	H	130.00	51.00	74.00	-35.75	Pass
5549.06	61.16	6.94	-17.01	51.10	Average Max	V	242.00	51.00	54.00	-2.90	Pass
3699.31	49.76	6.79	-20.60	35.96	Average Max	H	134.00	359.00	54.00	-18.04	Pass
8619.04	30.29	7.60	-10.85	27.04	Average Max	V	187.00	359.00	54.00	-26.97	Pass
2774.58	55.07	6.27	-22.68	38.66	Average Max	V	243.00	18.00	54.00	-15.34	Pass
17723.15	23.05	9.44	-3.17	29.32	Average Max	H	244.00	360.00	54.00	-24.68	Pass
7188.28	30.70	7.37	-11.65	26.41	Average Max	H	130.00	51.00	54.00	-27.59	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Date	Cal Cycle	Cal Due	In use
Conducted Emissions						
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☑
CHASE LISN	MN2050B	1018	08/07/2015	1 Year	08/07/2016	☑
Radiated Emissions						
R & S Receiver	ESL6	100178	05/27/2015	1 Year	05/27/2016	☑
Pre-Amplifier (1-26.5GHz)	8449B	3008A00715	03/04/2016	1 Year	03/04/2017	☑
Preamplifier (100KHz-7GHz)	LPA-6-30	11140711	02/19/2016	1 Year	02/19/2017	☑
ETS-Lingren Loop Antenna	6512	00049120	05/12/2015	1 Year	05/12/2016	☐
Bi-Log antenna (30MHz~2GHz)	JB1	A030702	08/12/2015	1 Year	08/12/2016	☑
Horn Antenna (1-26.5GHz)	3115	10SL0059	08/25/2015	1 Year	08/25/2016	☑
Tuned Dipole Antenna 30 - 1000 MHz (4pcs set)	AD-100	40133	10/02/2015	1 Year	10/02/2016	☐
3 Meters SAC	3M	N/A	08/08/2015	1 Year	08/08/2016	☑
10 Meters SAC	10M	N/A	09/05/2015	1 Year	09/05/2016	☑
RF Conducted Measurement						
Spectrum Analyzer	N9010A	10SL0219	08/20/2015	1 Year	08/20/2016	☑
R & S Receiver	ESIB 40	100179	05/23/2015	1 Year	05/23/2016	☐
Test Equity Environment Chamber	1007H	61201	07/31/2015	1 Year	07/31/2016	☐
USB RF Power Sensor	7002-006	10SL0190	09/03/2015	1 Year	09/03/2016	☐

Note: Equipment is allowed to have a 3 month extension past the calibration due date.

Test Software Version

Test Item	Vendor	Software	Version
Radiated Emission	EMISoft	EMISoft Vasona	V5.0
Conducted Emission	EMISoft	EMISoft Vasona	V5.0

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