

RF TEST REPORT

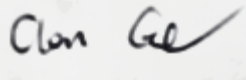


Report No.: FCC_RF_SL15041401-LHS-001 Rev. 3.0

Supersede Report No.: FCC_RF_SL15041401-LHS-001 Rev. 2.0

Applicant	:	Legrand
Product Name	:	Z-Wave Transceiver Device
Model No.	:	HA7040
Test Standard	:	47 CFR 15.249
Test Method	:	ANSI C63.10: 2013
FCC ID	:	YV8-HA7040
Dates of test	:	06/15/2015 to 06/18/2015
Issue Date	:	07/22/2015
Test Result	:	☒ Pass ☐ Fail
Equipment complied with the specification ☒		
Equipment did not comply with the specification ☐		

This Test Report is Issued Under the Authority of:

	
Ricky Wang	Chen Ge
Test Engineer	Engineer Reviewer

Issued By:
SIEMIC Laboratories
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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_RF_SL15041401-LHS-001	None	Original	06/18/2015
FCC_RF_SL15041401-LHS-001 Rev. 1.0	1.0	Add radio board photo	07/08/2015
FCC_RF_SL15041401-LHS-001 Rev. 2.0	2.0	Updated test data	07/22/2015
FCC_RF_SL15041401-LHS-001 Rev. 3.0	3.0	Update product name	07/22/2015

2 Executive Summary

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

Company: Pass & Seymour, Inc. d/b/a Legrand
Product: Z-Wave Transceiver Device
Model: HA7040

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	:	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	:	Z-Wave Transceiver Device
Model No.	:	HA7040
Trade Name	:	Legrand
Serial No.	:	N/A
Host Model No.	:	N/A
Input Power	:	3.3VDC
Power Adapter Manu/Model	:	N/A
Power Adapter SN	:	N/A
Date of EUT received	:	06/15/2015
Equipment Class/ Category	:	DXT
Clock Frequencies	:	N/A
Port/Connectors	:	N/A

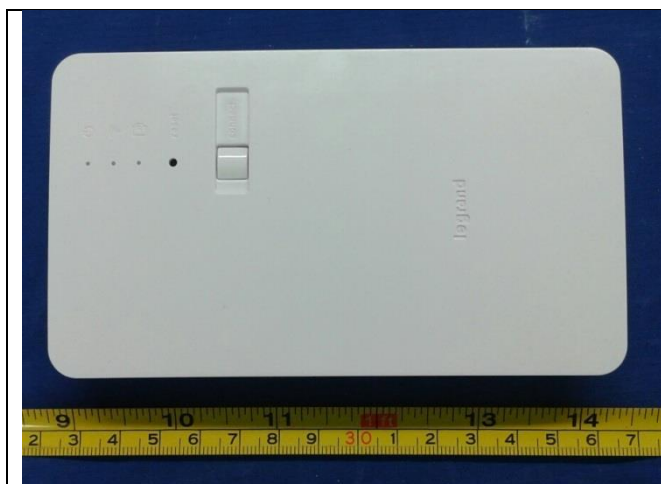
6.2 Radio Description

Radio Type	UHF RFID
Operating Frequency	908.40MHz/916.00MHz
Modulation	2FSK/2GFSK
Number of Channels	2
Antenna Type	Embedded antenna
Antenna Gain	3.48 dBi
Antenna Connector Type	Attached to PCBA

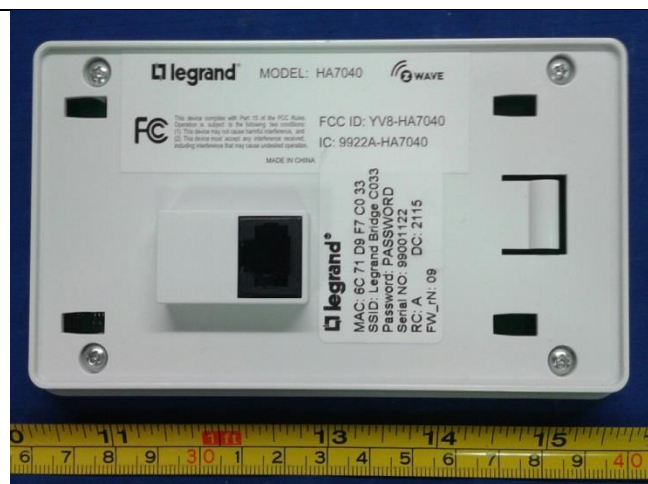
6.3 Power Setting

Frequency (MHz)	Modulation Type	Data Rate(kbps)	Power setting
908.40	2FSK	9.6	8
908.40	2FSK	40	8
916.00	2GFSK	100	8

6.4 EUT Photos – External



EUT – Top View



EUT – Bottom View



EUT – Left Side View



EUT – Right Side View



EUT – Top View



EUT – Bottom View

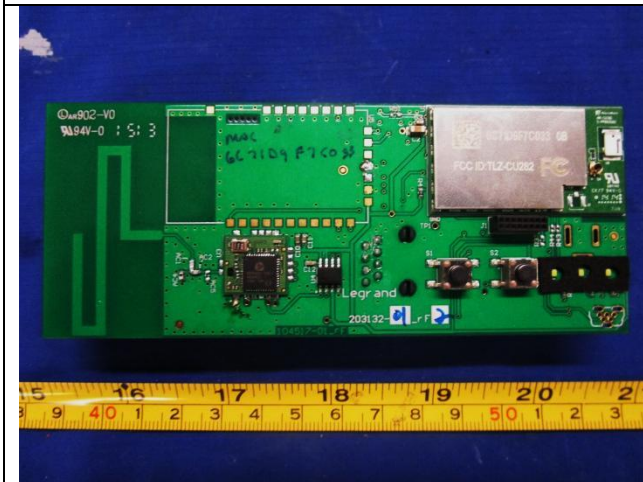
6.5 EUT Photos - Internal



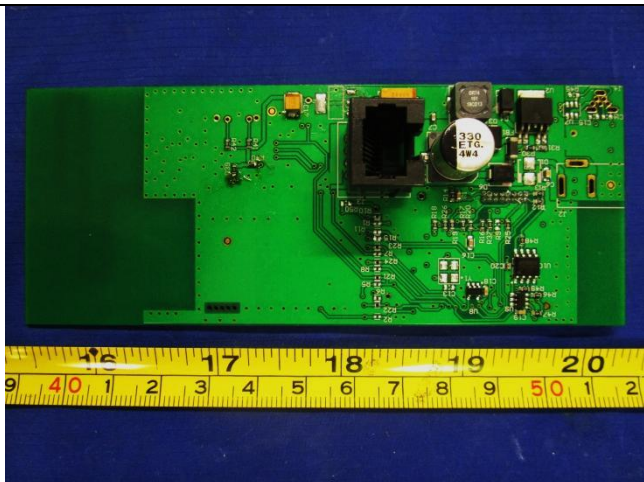
EUT-with cov



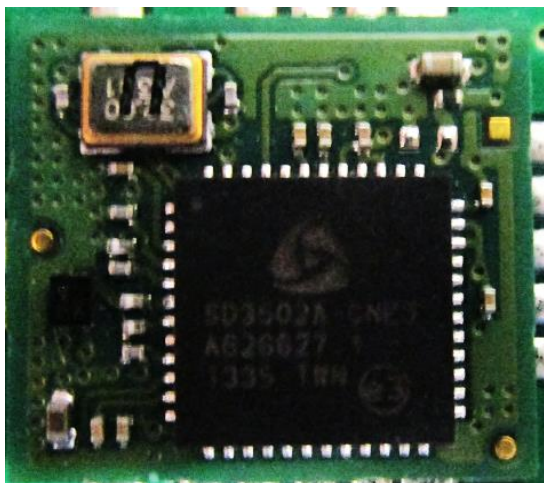
EUT-without cover



EUT - Top View



EUT - Bottom View



Z-Wave Module Top View



ZWave Module Bottom View

6.6 EUT Test Setup Photos



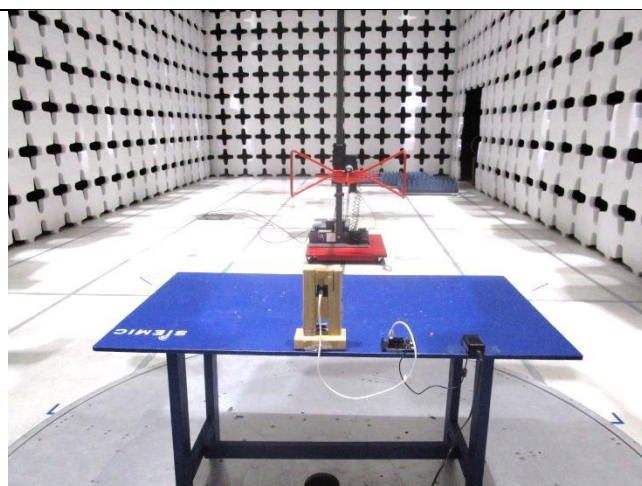
Conducted Emissions– Front View



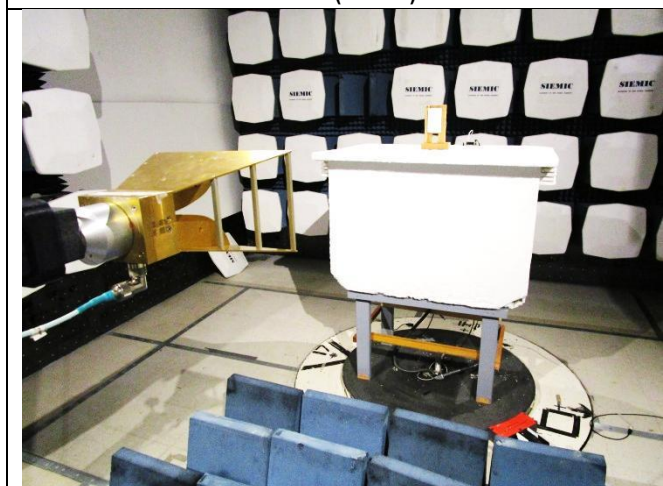
Conducted Emissions– Side View



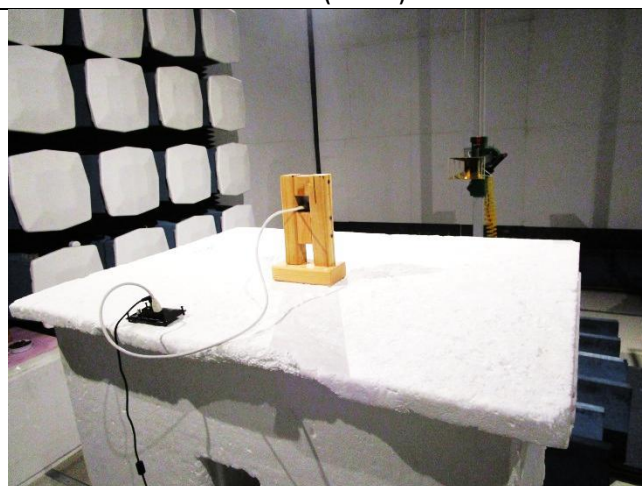
Radiated Emissions (<1GHz) – Front View



Radiated Emissions (<1GHz) – Rear View



Radiated Emissions (>1GHz) – Front View



Radiated Emissions (>1GHz) – Rear View

7 Supporting Equipment/Software and cabling Description

7.1 Supporting Equipment

Item	Supporting Equipment Description	Model	Serial Number	Manufacturer	Note
1	Laptop	ES420	30437961985	Dell	-
2	Debug Adapter	203133	-	Legrand	-

7.2 Cabling Description

Name	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
RJ45	Power module	J1	EUT	J3	1	No	-
-	-	-	-	-	-	-	-

7.3 Test Software Description

Test Item	Software	Description
RF Testing	Marvel W8782 Labtool	Set the EUT to transmit continuously in WIFI mode
RF Testing	Sigma RF-Link	Set the EUT to transmit continuously in Z-Wave mode

8 Test Summary

Test Item	Test standard		Test Method/Procedure		Pass / Fail
AC Conducted Emissions	FCC	15.207	FCC	ANSI C63.10 – 2013	☒ Pass ☐ N/A
20dB Bandwidth	FCC	15.249	FCC	DA00-705	☒ Pass ☐ N/A
Field strength of fundamental	FCC	15.249	FCC	ANSI C63.10 – 2013	☒ Pass ☐ N/A
Field strength of Harmonics	FCC	15.249	FCC	ANSI C63.10 – 2013	☒ Pass ☐ N/A
Radiated emissions outside of the specified frequency bands	FCC	15.249, 15.209	FCC	ANSI C63.10 – 2013	☒ Pass ☐ N/A
Restricted Band	FCC	15.205	FCC	ANSI C63.10 – 2013	☒ Pass ☐ N/A
Remark	- 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

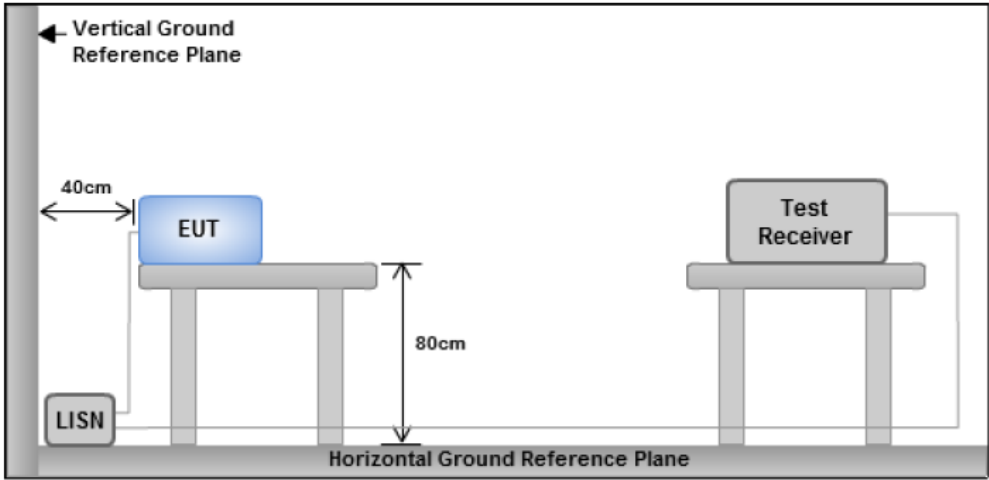
Emissions			
Test Item	Frequency Range	Description	Uncertainty
Radiated Emissions	30MHz – 1GHz	Confidence level of approximately 95% (in the case where distributions are normal), with a coverage factor of 2 (for EUTs < 0.5m X 0.5m X 0.5m)	+5.6dB/-4.5dB
Radiated Emissions	1GHz – 40GHz	Confidence level 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 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

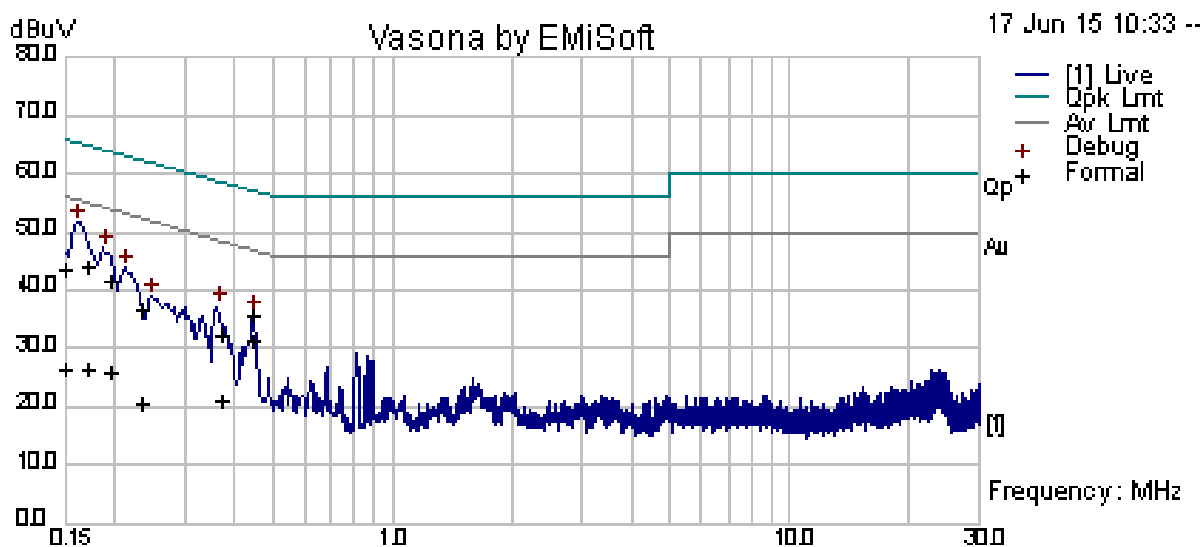
Spec	Item	Requirement	Applicable
47CFR§15.207	a)	For Low-power radio-frequency devices that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies, within the band 150 kHz to 30 MHz, shall not exceed the limits in the following table, as measured using a 50 μ H/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 was tested with host board with AC 120V 60Hz	
Result		☒ Pass ☐ Fail	

Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	06/16/2015			
Remarks	Line			

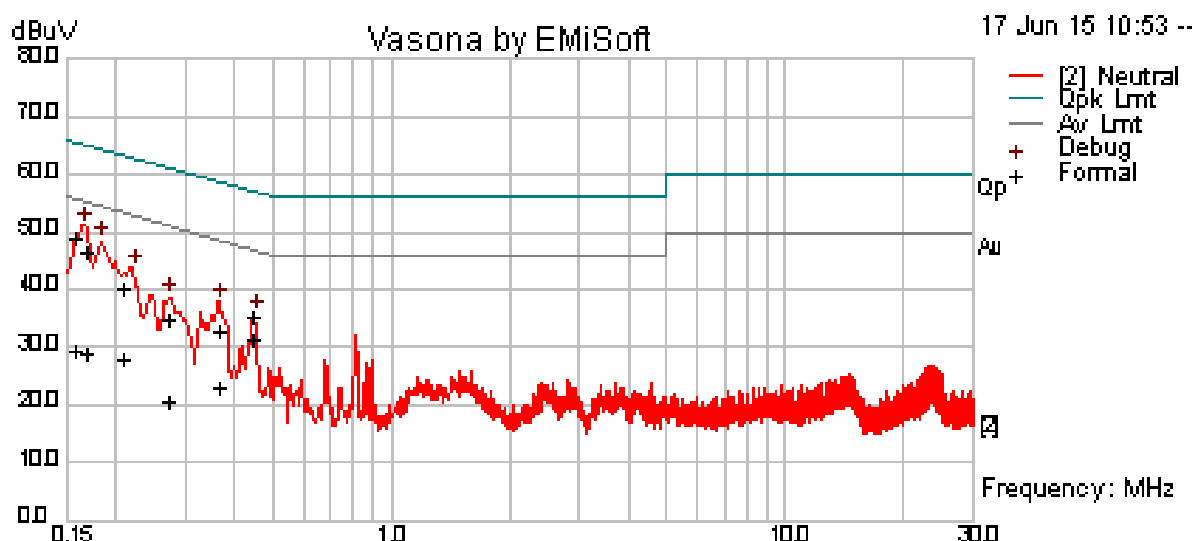


Line Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.15	33.06	10.00	0.76	43.82	Quasi Peak	Live	66.00	-22.18	Pass
0.17	33.15	10.00	0.75	43.90	Quasi Peak	Live	64.92	-21.02	Pass
0.20	31.04	10.00	0.74	41.79	Quasi Peak	Live	63.77	-21.98	Pass
0.44	24.90	10.01	0.73	35.64	Quasi Peak	Live	56.97	-21.33	Pass
0.37	21.68	10.01	0.72	32.41	Quasi Peak	Live	58.47	-26.07	Pass
0.24	25.95	10.00	0.73	36.68	Quasi Peak	Live	62.26	-25.57	Pass
0.15	15.69	10.00	0.76	26.45	Average	Live	56.00	-29.55	Pass
0.17	15.65	10.00	0.75	26.40	Average	Live	54.92	-28.52	Pass
0.20	15.22	10.00	0.74	25.96	Average	Live	53.77	-27.80	Pass
0.44	20.84	10.01	0.73	31.58	Average	Live	46.97	-15.39	Pass
0.37	10.53	10.01	0.72	21.26	Average	Live	48.47	-27.22	Pass
0.24	10.11	10.00	0.73	20.84	Average	Live	52.26	-31.41	Pass

Conducted Emission Test Results

Test specification:	Conducted Emissions			
Environmental Conditions:	Temp(°C):	21	Result:	☒ Pass ☐ Fail
	Humidity (%):	42		
	Atmospheric(mbar):	1021		
Mains Power:	120Vac, 60Hz			
Tested by:	Teody Manansala			
Test Date:	06/16/2015			
Remarks	Neutral			



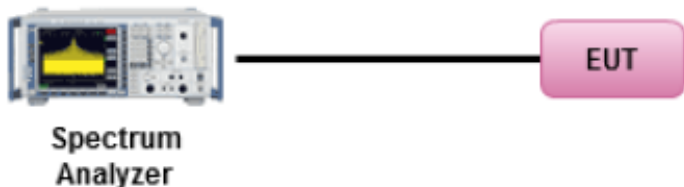
Neutral Plot at 120Vac, 60Hz

Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line	Limit (dBuV)	Margin (dB)	Pass /Fail
0.157347	38.3	10	0.75	49.06	Quasi Peak	Neutral	65.6	-16.54	Pass
0.167531	35.87	10	0.75	46.62	Quasi Peak	Neutral	65.08	-18.46	Pass
0.2081	29.4	10	0.74	40.14	Quasi Peak	Neutral	63.28	-23.14	Pass
0.366938	22.16	10.01	0.72	32.88	Quasi Peak	Neutral	58.57	-25.69	Pass
0.445948	24.37	10.01	0.73	35.1	Quasi Peak	Neutral	56.95	-21.85	Pass
0.27113	24.01	10	0.72	34.73	Quasi Peak	Neutral	61.08	-26.35	Pass
0.157347	18.71	10	0.75	29.46	Average	Neutral	55.6	-26.14	Pass
0.167531	18.42	10	0.75	29.17	Average	Neutral	55.08	-25.91	Pass
0.2081	17.06	10	0.74	27.81	Average	Neutral	53.28	-25.48	Pass
0.366938	12.14	10.01	0.72	22.86	Average	Neutral	48.57	-25.71	Pass
0.445948	20.46	10.01	0.73	31.2	Average	Neutral	46.95	-15.75	Pass
0.27113	9.83	10	0.72	20.55	Average	Neutral	51.08	-30.53	Pass

Note: The results above show only the worst case.

10.2 20dB Bandwidth

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.249	-	-	☒
Test Setup			
Test Procedure	<u>20dB Emission bandwidth measurement procedure</u> - Set RBW $\geq$ 1% of 20dB Bandwidth - Set the video bandwidth (VBW) $\geq$ 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	06/16/2015	Environmental condition	Temperature 23°C Relative Humidity 42% Atmospheric Pressure 1021mbar
Remark	N/A		
Result	☒ Pass ☐ Fail		

Equipment Setting

TEST	RBW	VBW	SPAN	Detector	SWEEP	Trace	NOTES
20dB Bandwidth	~1% OBW	3 x RBW	2*OBW	Peak	Auto	Max hold	-

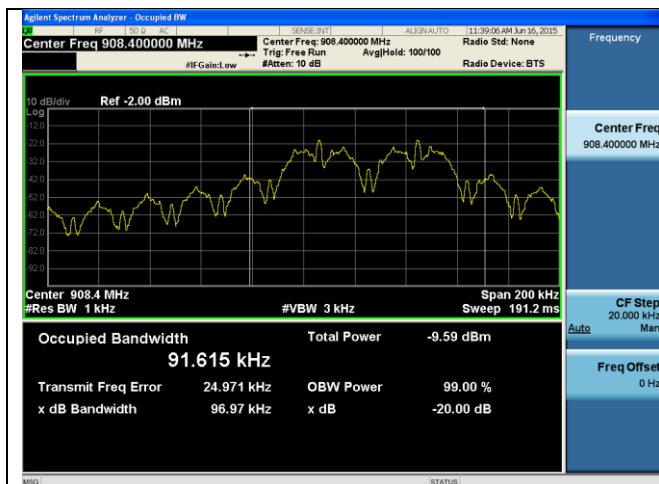
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes ☐ N/A

20dB Bandwidth measurement results

Type	Frequency (MHz)	Modulation Type	Data Rate(kbps)	Result(KHz)	Limit(KHz)
20dB BW	908.40	2FSK	9.6	96.97	-
	908.40	2FSK	40	86.31	-
	916.00	2GFSK	100	124.00	-

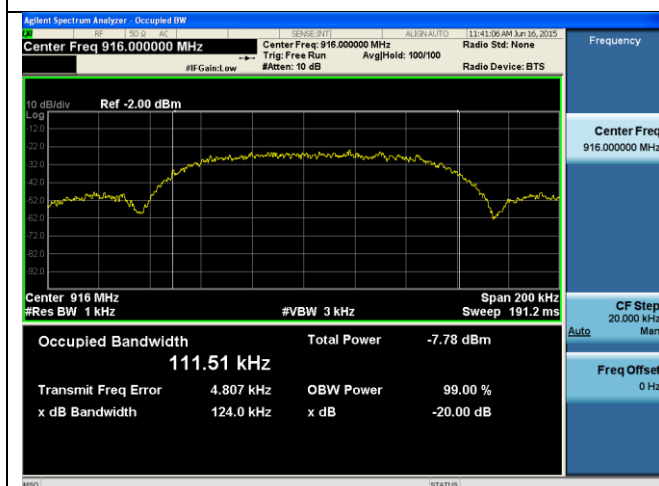
20dB Bandwidth Test Plots



20dB BW -908.40MHz-9.6kbps



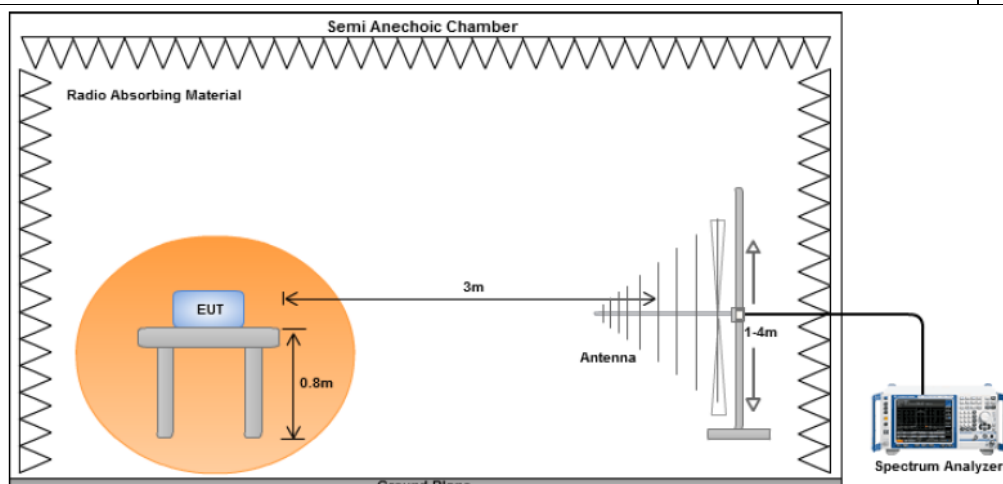
20dB BW -908.40MHz-40kbps



20dB BW -916.00MHz-100kbps

10.3 Field Strength of Fundamental Frequency

Requirement(s):

Spec	Item	Requirement	Applicable										
§ 15.249	a)	The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:	☒										
		<table><tr><th>Fundamental frequency</th><th>Field strength of fundamental (millivolts/meter)</th></tr><tr><td>902-928 MHz</td><td>50</td></tr><tr><td>2400-2483.5 MHz</td><td>50</td></tr><tr><td>5725-5875 MHz</td><td>50</td></tr><tr><td>24.0-24.25 GHz</td><td>250</td></tr></table>		Fundamental frequency	Field strength of fundamental (millivolts/meter)	902-928 MHz	50	2400-2483.5 MHz	50	5725-5875 MHz	50	24.0-24.25 GHz	250
		Fundamental frequency		Field strength of fundamental (millivolts/meter)									
		902-928 MHz		50									
		2400-2483.5 MHz		50									
5725-5875 MHz	50												
24.0-24.25 GHz	250												
Test Setup													
Test 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 Peak and Average measurement was then made for that frequency point.												
Test Date	06/18/2015	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar										
Remark	-												
Result	☒ Pass ☐ Fail												

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Field Strength of Fundamental Test results

908.40MHz-9.6kbps

Frequency MHz	Data Rate (kbps)	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
908.40	9.6	103.14	6.64	-16.62	93.16	Quasi Max	H	134	173	94	-0.84	Pass
908.40	9.6	98.31	6.64	-16.62	88.33	Quasi Max	V	136	224	94	-5.67	Pass

908.40MHz-40kbps

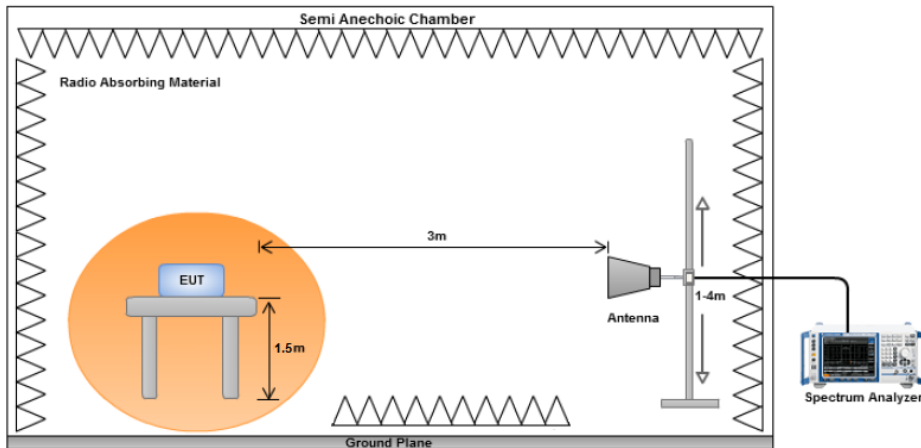
Frequency MHz	Data Rate (kbps)	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
908.40	40	103.35	6.64	-16.62	92.90	Quasi Max	H	135	171	94	-1.10	Pass
908.40	40	96.46	6.64	-16.62	87.43	Quasi Max	V	134	220	94	-6.57	Pass

916.00MHz-100kbps

Frequency MHz	Data Rate (kbps)	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
916.00	100	102.45	6.67	-16.57	92.87	Quasi Max	H	100	317	94	-1.45	Pass
916.00	100	99.21	6.67	-16.57	88.9	Quasi Max	V	154	298	94	-4.69	Pass

10.4 Field Strength of Harmonics

Requirement(s):

Spec	Item	Requirement	Applicable										
§ 15.249	a)	The field strength of emissions from intentional radiators operated within these frequency bands shall comply with the following:	☒										
		<table><tr><th>Fundamental frequency</th><th>Field strength of harmonics (microvolts/meter)</th></tr><tr><td>902-928 MHz</td><td>500</td></tr><tr><td>2400-2483.5 MHz</td><td>500</td></tr><tr><td>5725-5875 MHz</td><td>500</td></tr><tr><td>24.0-24.25 GHz</td><td>2500</td></tr></table>		Fundamental frequency	Field strength of harmonics (microvolts/meter)	902-928 MHz	500	2400-2483.5 MHz	500	5725-5875 MHz	500	24.0-24.25 GHz	2500
		Fundamental frequency		Field strength of harmonics (microvolts/meter)									
		902-928 MHz		500									
		2400-2483.5 MHz		500									
5725-5875 MHz	500												
24.0-24.25 GHz	2500												
Test Setup													
Test Procedure	1. 2. 3. 4. 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: a. b. c. 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.												
Test Date	06/17/2015	Environmental condition	Temperature 22°C Relative Humidity 46% Atmospheric Pressure 1020mbar										
Remark	-												
Result	☒ Pass ☐ Fail												

Test Data ☒ Yes (See below) ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test Result

Note: The EUT was tested from 1GHz to 10GHz.

908.40MHz-9.6kbps

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
1816.864	45.71	9.79	-10.43	45.06	Peak Max	H	228	357	74	-28.94	Pass
2725.246	47.97	11.43	-4.72	54.69	Peak Max	H	226	357	74	-19.31	Pass
3633.785	43.16	12.56	-0.5	55.22	Peak Max	H	227	10	74	-18.78	Pass
1816.864	37.82	9.79	-10.43	37.17	Average Max	H	228	357	54	-16.83	Pass
2725.246	42.95	11.43	-4.72	49.67	Average Max	H	226	357	54	-4.33	Pass
3633.785	32.88	12.56	-0.5	44.94	Average Max	H	227	10	54	-9.06	Pass

908.40MHz-40kbps

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
1816.779	45.59	9.78	-10.44	44.94	Peak Max	H	224	357	74	-29.06	Pass
2725.194	47.68	11.43	-4.72	54.4	Peak Max	H	225	356	74	-19.6	Pass
3633.563	42.17	12.56	-0.51	54.22	Peak Max	H	226	357	74	-19.78	Pass
1816.779	37.47	9.78	-10.44	36.81	Average Max	H	224	357	54	-17.19	Pass
2725.194	42.57	11.43	-4.72	49.29	Average Max	H	225	356	54	-4.71	Pass
3633.563	31.9	12.56	-0.51	43.96	Average Max	H	226	357	54	-10.04	Pass

916.00MHz-100kbps

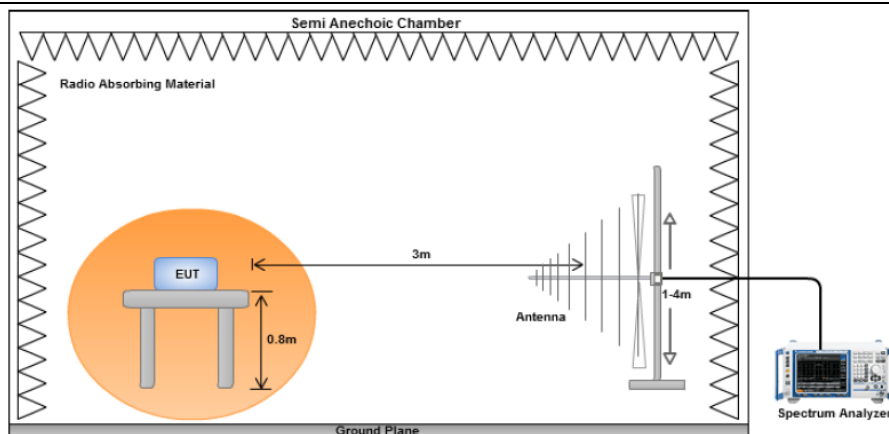
Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
1831.94	37.16	9.87	-10.35	36.68	Peak Max	H	218	356	74	-37.32	Pass
2748.082	50.84	11.46	-4.54	57.76	Peak Max	H	221	15	74	-16.24	Pass
3664.015	44.53	12.69	-0.33	56.88	Peak Max	H	100	351	74	-17.12	Pass
1831.94	23.12	9.87	-10.35	22.64	Average Max	H	218	356	54	-31.36	Pass
2748.082	46.25	11.46	-4.54	53.17	Average Max	H	221	15	54	-0.83	Pass
3664.015	37.83	12.69	-0.33	50.19	Average Max	H	100	351	54	-3.81	Pass

10.5 Radiated Emissions Outside Of The Specified Frequency Bands- Below 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.249	d)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.	☒

Test Setup



Test 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.

Test Date	06/18/2015	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	-		
Result	☒ Pass ☐ Fail		

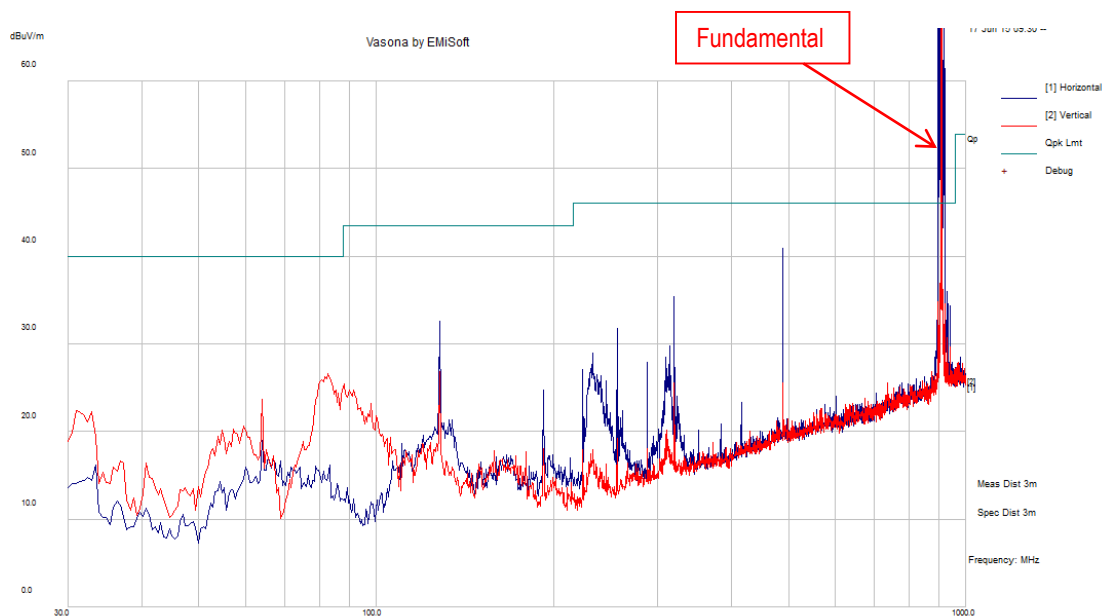
Test Data ☒ Yes ☐ N/A

Test Plot ☒ Yes (See below) ☐ N/A

Radiated Emission Test Results (Below 1GHz)

Note: All frequencies at the edge of 902MHz to 928MHz were tested and below the §15.209 limit.

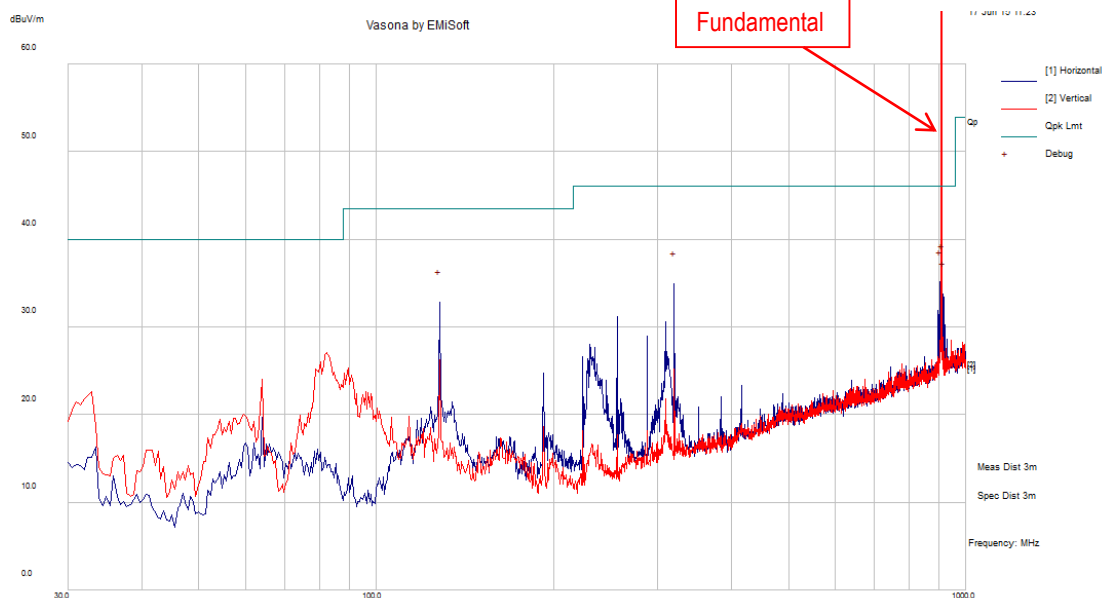
Test specification	below 1GHz			
Environmental Conditions:	Temp (°C):	26.1	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	120VAC, 60Hz			
Tested by:	Ricky Wang			
Test Date:	06/18/2015			
Remarks:	908MHz-9.6kbps			



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
193.0185	36.72	2.49	-27.06	12.15	Quasi Max	H	250	160	43.52	-31.37	Pass
128.98	40.3	2.06	-24.73	17.63	Quasi Max	H	158	193	43.52	-25.89	Pass
492.9653	34.27	4.12	-20.81	17.58	Quasi Max	H	324	43	46.02	-28.44	Pass
323.1682	39.38	3.13	-24.54	17.97	Quasi Max	H	101	118	46.02	-28.05	Pass
257.0615	38.79	2.8	-26.66	14.92	Quasi Max	H	101	182	46.02	-31.1	Pass
232.1709	50.61	2.69	-27.28	26.01	Quasi Max	H	127	177	46.02	-20.01	Pass

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

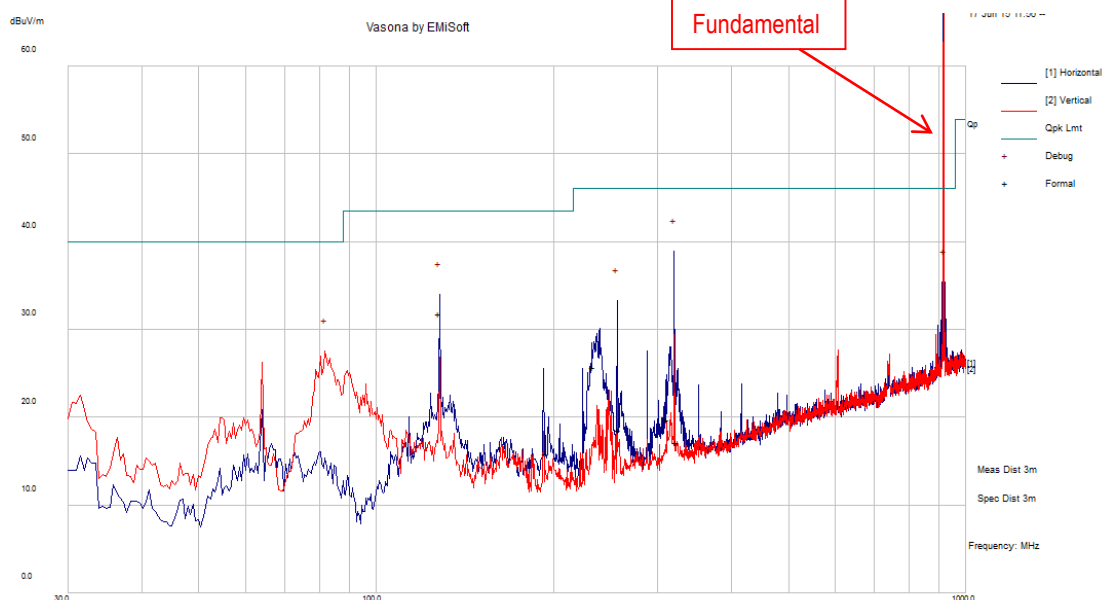
Test specification	below 1GHz			
Environmental Conditions:	Temp (°C):	26.1	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	120VAC, 60Hz			
Tested by:	Ricky Wang			
Test Date:	06/18/2015			
Remarks:	908.40MHz-40kbps			



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
128.01	54.44	2.05	-24.7	31.79	Quasi Max	H	207	193	43.52	-11.73	Pass
193.7841	40.3	2.49	-26.94	15.86	Quasi Max	H	150	203	43.52	-27.66	Pass
322.8596	38.6	3.13	-24.56	17.18	Quasi Max	H	102	314	46.02	-28.84	Pass
257.7981	42.32	2.8	-26.59	18.53	Quasi Max	H	112	241	46.02	-27.49	Pass
232.8901	50.28	2.69	-27.25	25.71	Quasi Max	H	126	165	46.02	-20.31	Pass
311.7764	41.53	3.05	-24.9	19.69	Quasi Max	H	132	114	46.02	-26.33	Pass

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

Test specification	below 1GHz			
Environmental Conditions:	Temp (°C):	26.1	Result	Pass
	Humidity (%)	47.5		
	Atmospheric (mbar):	1020		
Mains Power:	120VAC, 60Hz			
Tested by:	Ricky Wang			
Test Date:	06/18/2015			
Remarks:	916.00MHz-100kbps			

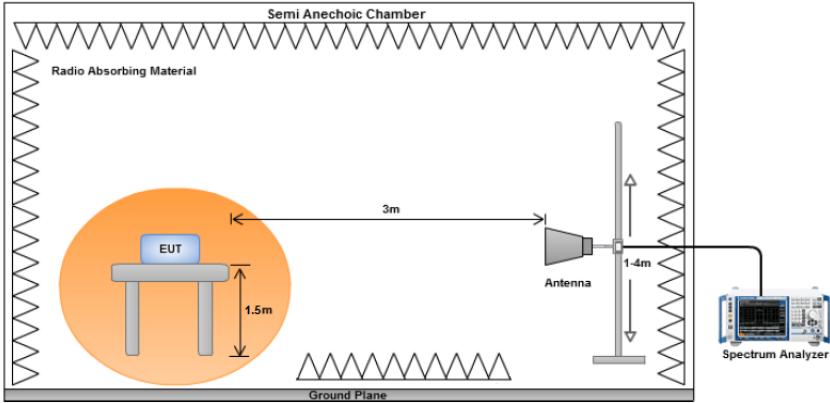


Frequency MHz	Raw dBuV	Cable Loss	AF dB	Level dBuV/m	Measurement Type	Pol	Hgt cm	Azt Deg	Limit dBuV/m	Margin dB	Pass /Fail
320	60.39	3.11	-24.67	38.84	Quasi Max	H	100	288	46.02	-7.18	Pass
128.0022	55.75	2.05	-24.7	33.1	Quasi Max	H	169	214	43.52	-10.42	Pass
82.0924	50.43	1.6	-30.73	21.3	Quasi Max	V	159	197	40	-18.7	Pass
255.9863	56.35	2.79	-26.77	32.37	Quasi Max	H	100	218	46.02	-13.65	Pass
192.9413	36.69	2.49	-27.07	12.1	Quasi Max	H	257	184	43.52	-31.42	Pass
240.0147	48.31	2.72	-26.97	24.06	Quasi Max	H	134	260	46.02	-21.96	Pass

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

10.6 Radiated Emissions Outside Of The Specified Frequency Bands- Above 1GHz

Requirement(s):

Spec	Item	Requirement	Applicable
§ 15.249	d)	Emissions radiated outside of the specified frequency bands, except for harmonics, shall be attenuated by at least 50 dB below the level of the fundamental or to the general radiated emission limits in §15.209, whichever is the lesser attenuation.	☒
Test Setup			
Test Procedure	- 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: - 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.		
Test Date	06/18/2015	Environmental condition	Temperature 23°C Relative Humidity 44% Atmospheric Pressure 1021mbar
Remark	-		
Result	☒ Pass ☐ Fail		

Test Data ☒ Yes ☐ N/A

Test Plot ☐ Yes (See below) ☒ N/A

Test Result

908.40MHz-9.6Kkbps

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
3195.016	42.4	11.85	-2.13	52.12	Peak Max	H	241	356	74	-21.88	Pass
1838.097	42.53	9.91	-10.32	42.12	Peak Max	V	209	28	74	-31.88	Pass
3195.016	29.12	11.85	-2.13	38.85	Average Max	H	241	356	54	-15.15	Pass
1838.097	29.21	9.91	-10.32	28.8	Average Max	V	209	28	54	-25.2	Pass

908.40MHz-40Kkbps

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
3194.966	41.85	11.85	-2.13	51.58	Peak Max	H	173	27	74	-22.42	Pass
2458.957	43.85	11.13	-6.75	48.23	Peak Max	H	174	209	74	-25.77	Pass
3194.966	28.86	11.85	-2.13	38.58	Average Max	H	173	27	54	-15.42	Pass
2458.957	29.7	11.13	-6.75	34.08	Average Max	H	174	209	54	-19.92	Pass

916.00MHz-100Kkbps

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
3198.753	41.97	11.85	-2.12	51.71	Peak Max	H	385	13	74	-22.29	Pass
2423.039	42.18	11.1	-6.95	46.34	Peak Max	H	274	31	74	-27.66	Pass
3198.753	28.79	11.85	-2.12	38.53	Average Max	H	385	13	54	-15.47	Pass
2423.039	29.71	11.1	-6.95	33.87	Average Max	H	274	31	54	-20.13	Pass

Annex A. TEST INSTRUMENT

Instrument	Model	Serial #	Cal Cycle	Cal Due	In use
Conducted Emissions					
Spectrum Analyzer	N9010A	MY50210206	1 Year	08/13/2015	☒
Signal Analyzer	FSIQ7	825555/013	1 Year	05/28/2016	☐
V-LISN (150 kHz – 30 MHz)	NNLK 8129	8129-190	1 Year	08/11/2015	☒
LISN (9 kHz – 30 MHz)	MN2050B	1018	1 Year	07/31/2015	☒
TLISN	ISN T800	30814	1 Year	08/08/2015	☐
Radiated Emissions					
R & S Receiver	ESL6	100178	1 Year	05/27/2016	☒
EMI Test Receiver	ESIB 40	100179	1 Year	05/24/2016	☒
Antenna - Biconlog (30 MHz – 2 GHz)	JB1	A030702	1 Year	08/12/2015	☒
DoubleRidged Waveguide Horn Antenna (1-18 GHz)	3115	10SL0059	1 Year	08/11/2015	☒
Horn Antenna (18-40 GHz)	AH-840	101013	1 Year	08/11/2015	☐
RF Pre-Amplifier	LPA-6-30	11140711	1 Year	02/19/2016	☒
Microwave Preamplifier (18-40 GHz)	PA-840	181251	1 Year	02/19/2016	☒
10 Meters SAC	10M	N/A	1 Year	09/05/2015	☒
RF Conducted Measurement					
Spectrum Analyzer	N9010A	MY50210206	1 Year	8/13/2015	☒
Spectrum Analyzer	E4407B	US88441016	1 Year	03/30/2015	☐
R & S Receiver	ESIB 40	100179	1 Year	05/24/2016	☐

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