EMC TEST REPORT

Report: EMC_SL16072901-SPC-007_FCC15B
Supersedes: None

Applicant Name:	SpiderCloud Wireless, Inc.
Product Name:	SpiderCould Radio Node
Model Name:	SCRN-310-0205
Test Standard:	FCC 15 Subpart B (Class A)
Test Method:	ANSI C63.4: 2014
Date of Test:	2016-09-19; 2016-10-10/11/13
Report Issue Date:	2016-10-17

Test Result: ☒ Pass ☐ Fail

Equipment complied with the specifications: ☒

Equipment did not comply with the specifications: ☐

This test report is issued under the authority of:

Full Name:	Bryan Smith	Full Name:	Michael R. Gates
Title:	JR EMC Test Engineer	Title:	Lead Lab Engineer

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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, CA 95035 USA

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 conformity assessment

Country/Region	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

Table of Contents

1. Report revision history

Report No.	Version No.	Description	Issue Date
EMC_SL16072901-SPC-007_FCC15B	Original	FCC15B Class A Report	2016-10-17

2. Executive summary

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

Company: SpiderCloud Wireless, Inc.
Product: SpiderCould Radio Node
Model: SCRN-310-0205

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:	SpiderCloud Wireless, Inc.
Applicant Address:	475 Sycamore Dr, Milpitas, CA 95035
Manufacturer Name:	SpiderCloud Wireless, Inc.
Manufacturer Address:	475 Sycamore Dr, Milpitas, CA 95035

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

5. Modification

Index	Item	Description	Note
N/A	N/A	N/A	N/A

6. Test software version

Test Item	Vendor	Software	Version
Radiated Emission	EMISoft	EMISoft Vasona	V6.013
Conducted Emission	EMISoft	EMISoft Vasona	V5.095

7. EUT Information

7.1. EUT Description

Product Name:	SpiderCloud Radio Node
Model No.:	SCRN-310-0205 (with Band 2 LTE - 1960MHz & Band 5 LTE/UMTS - 881.5MHz)
Trade Name:	SpiderCloud Wireless
Serial No.:	EUT # 1 - Band 2 LTE - 1960MHz & Band 5 UMTS - 881.5MHz: 16238X21747 EUT # 2 - Band 2 LTE - 1960MHz & Band 5 LTE - 881.5MHz: 16238X21742
Input Power:	+56VDC
Power Adapter Manu/Model:	PoE - Phihong / POE36U-1AT-R REV. D
Power Adapter SN:	P13801913D1
Hardware version:	02283-01
Software version:	SCOC 5.2.0
Date of EUT received:	9/19/2016
Equipment Class/ Category:	Class A / ITE
Highest frequency generated or used in the device or on which the device operates or tunes:	EUT # 1 – Band 2 LTE 1960MHz / Band 5 UMTS 881.5MHz EUT # 2 – Band 2 LTE 1960MHz / Band 5 LTE 881.5MHz
Port/Connectors:	RJ45
Remark:	2 separate EUTs were used for testing in this report with 2 separate test configurations. EUT #1 was configured for Band 5 UMTS (881.5MHz) and EUT #2 was configured for Band 5 LTE (881.5MHz). Each EUT was tested individually with the tested EUT configured as the Master and non-tested EUT used for support equipment configured as the Client.
AC Power Cord Type:	N/A
DC Power Cable Type:	RJ45 (PoE)

7.2. EUT Test modes / Configuration description

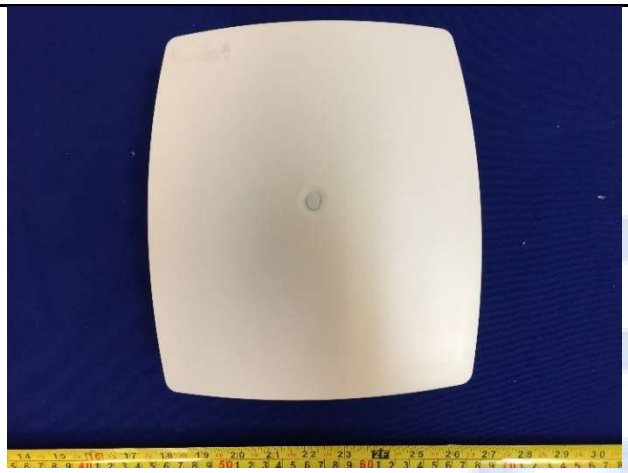
7.2.1. EUT Test modes: Pre-test mode

Prescan Test Mode		Notes
Pre-test Mode 1	Manufacturer Specified	Band 5 UMTS 881.5MHz was set to continuously transmit
Pre-test Mode 2	Manufacturer Specified	Band 5 LTE 881.5MHz was set to continuously transmit
Remark:	2 separate EUTs were used for testing in this report with 2 separate test configurations. EUT #1 was configured for Band 5 UMTS (881.5MHz) and EUT #2 was configured for Band 5 LTE (881.5MHz). Each EUT was tested individually with the tested EUT configured as the Master and non-tested EUT used for support equipment configured as the Client.	

7.2.2. EUT Test modes: Final test mode

Final Test Mode		Notes
Final-test Mode 1	Manufacturer Specified	Band 5 UMTS 881.5MHz was set to continuously transmit
Final-test Mode 2	Manufacturer Specified	Band 5 LTE 881.5MHz was set to continuously transmit
Remark:	2 separate EUTs were used for testing in this report with 2 separate test configurations. EUT #1 was configured for Band 5 UMTS (881.5MHz) and EUT #2 was configured for Band 5 LTE (881.5MHz). Each EUT was tested individually with the tested EUT configured as the Master and non-tested EUT used for support equipment configured as the Client.	

7.3. EUT Photos | External

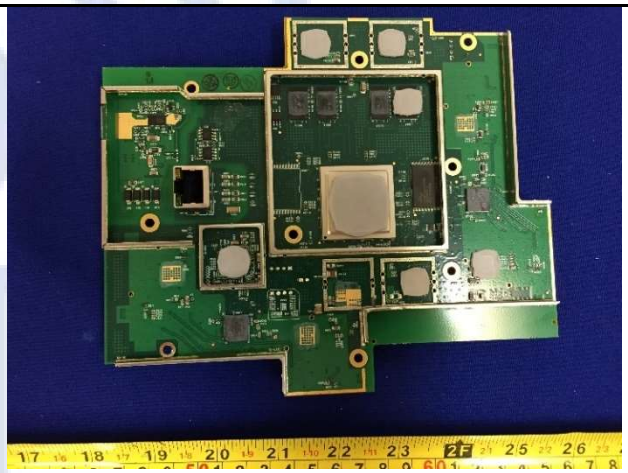
	
Top View	Bottom View
	
Front View	Rear View
	
Left Side View	Right Side View

7.4. EUT Photos | Internal

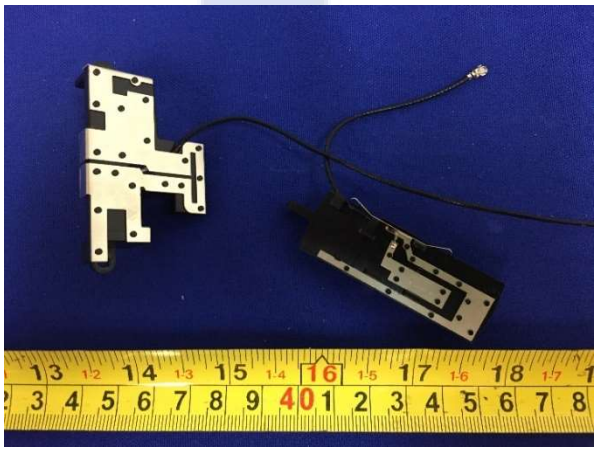
Open case Top view

Main PCB with shielding - Top View

Main PCB without shielding - Top View

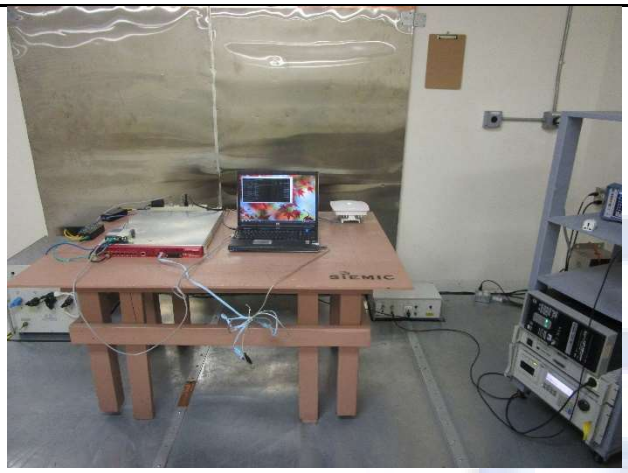
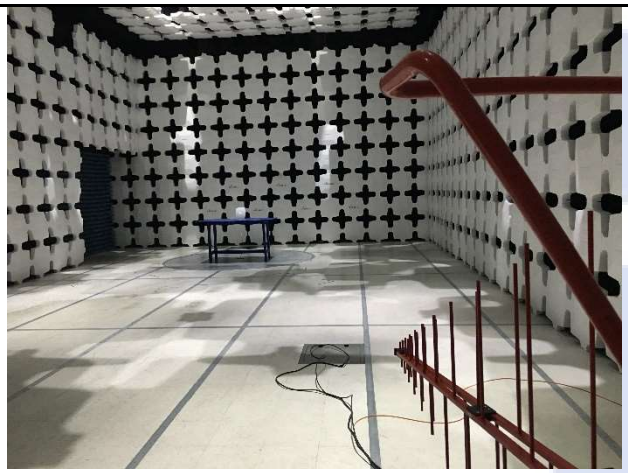
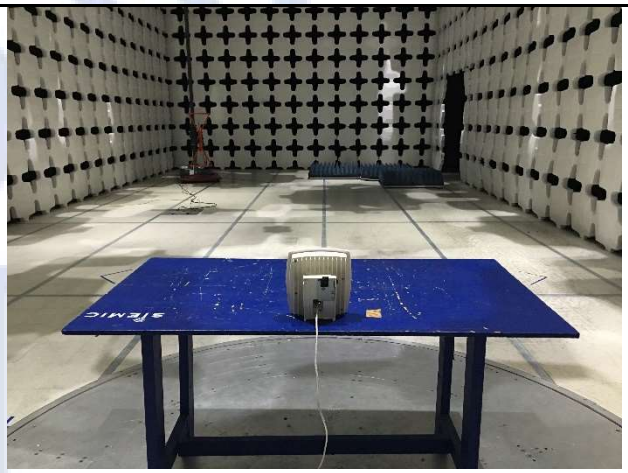
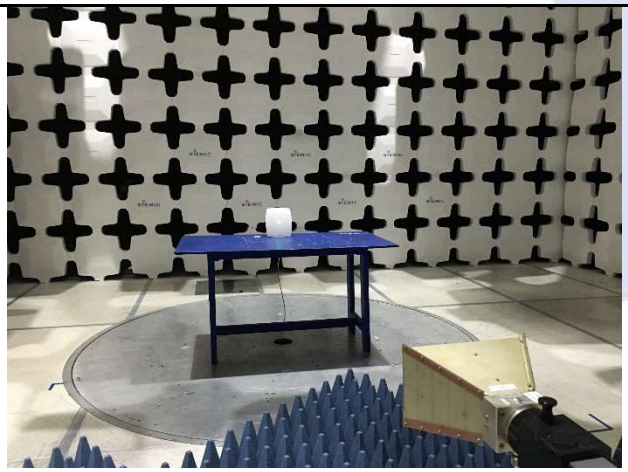
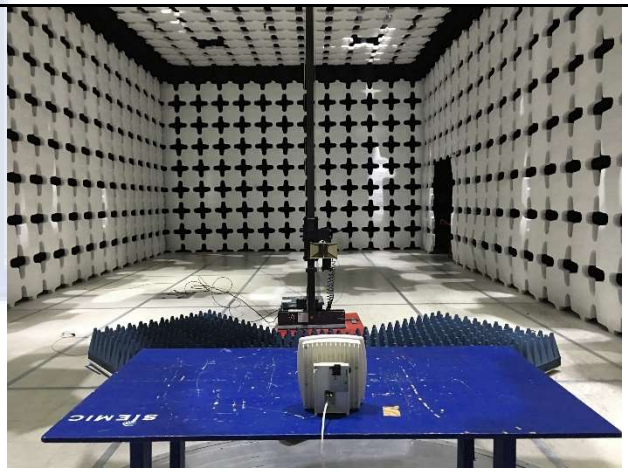


Main PCB without shielding - Bottom View



Internal antennas

7.5. EUT Photos | Test setup

	
AC Line Conducted Emissions – Front View	AC Line Conducted Emissions – Rear View
	
Radiated Emissions 30-1000MHz – Front View	Radiated Emissions 30-1000MHz – Rear View
	
Radiated Emissions >1GHz – Front View	Radiated Emissions >1GHz – Rear View

8. Supporting equipment / Software / Cabling information

8.1. Support equipment

Item	Support Equipment Description	Model	Serial Number	Manufacturer	Notes
1	EUT Band 5 UMTS 881.5MHz	SCRN-310-0205	16238X21747	SpiderCloud Wireless	configured as the client for Band 5 LTE EUT
2	EUT Band 5 LTE 881.5MHz	SCRN-310-0205	16238X21742	SpiderCloud Wireless	configured as the client for Band 5 UMTS
3	SpiderCloud Service Node	SCSN-8000	12044B02090	SpiderCloud Wireless	used to exercise EUT
4	Laptop	dv8000	CND6081P8T	HP	used to configure EUT transmission
5	Laptop AC/DC Adapter	PPP009L	592C40ALLSOLR	HP	used to power laptop
6	Switch	GS105 v3	27329A3A0030C	NetGear	used for communication between equipment
7	Switch AC/DC Adapter	DSA-12R-12 AUS 1200	N/A	NetGear	used to power switch
8	PoE to EUT # 1	POE36U-1AT-R	P13801913D1	PHIHONG	used for powering and configuring EUT # 1
9	PoE to EUT # 2	POE36U-1AT-R	P13800877D1	PHIHONG	used for powering and configuring EUT # 2

8.2. I/O Ports

Item	Connection Start		Connection Stop		Length / shielding Info		Note
	From	I/O Port	To	I/O Port	Length (m)	Shielding	
1	EUT # 1 Band 5 UMTS 881.5MHz	RJ45	PoE 1	Data & Power Out Port	>3	unshielded	-
2	PoE 1	Data In Port	Switch	RJ45 Port 2	>3	unshielded	-
3	PoE 2	Data In Port	Switch	RJ45 Port 3	>3	unshielded	-
4	EUT # 2 Band 5 LTE 881.5MHz	RJ45	PoE 2	Data & Power Out Port	>3	unshielded	-
5	Service Node	RJ45 SFP+ Module Port 2	Switch	RJ45 Port 5	>3	unshielded	-
6	Laptop	RJ45	Switch	RJ45 Port 1	>3	unshielded	-
7	Service Node	RJ45 Console Port	RJ45 to RS232 Cable	RS232 Port	<3	unshielded	-
8	RS232 to USB Cable	RS232 Port	Laptop	USB	<3	unshielded	-

8.3. Test software description

Test Item	Software	Description
1	ePerview	Software used via Laptop to set EUT to transmit at desired band continuously.

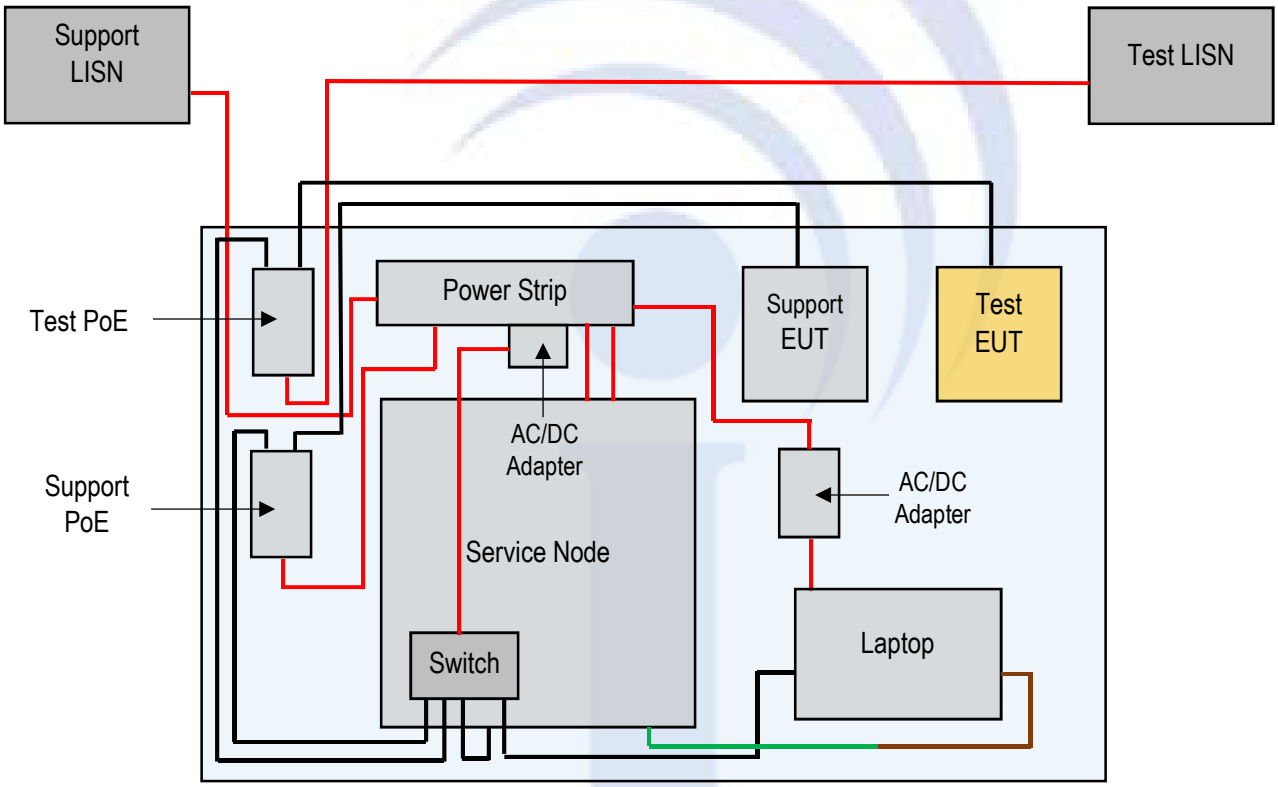
8.4. System setup block diagram

Red Cables = Power Cables

Black Cables = RJ45 Cables

Green Cable = RJ45 to RS232 Cable

Brown Cable = RS232 to USB Cable



9. Test summary

Emissions			
Test Item	**Test Standard**	**Test Method / Procedure**	**Pass / Fail**
AC Conducted Emissions	FCC 15 Subpart B (Class A)	ANSI C63.4:2014	X Pass Fail N/A
Radiated Spurious Emissions Below 1GHz	FCC 15 Subpart B (Class A)	ANSI C63.4:2014	X Pass Fail N/A
Radiated Spurious Emissions Above 1GHz	FCC 15 Subpart B (Class A)	ANSI C63.4:2014	X Pass Fail N/A

10. Measurement uncertainty

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

11. Frequency Range of Radiated Measurements

(b) For unintentional radiators:

(1) Except as otherwise indicated in paragraphs (b)(2) or (b)(3) of this section, for an unintentional radiator, including a digital device, the spectrum shall be investigated from the lowest radio frequency signal generated or used in the device, without going below the lowest frequency for which a radiated emission limit is specified, up to the frequency shown in the following table:

(2) A unintentional radiator, excluding a digital device, in which the highest frequency generated in the device, the highest frequency used in the device and the highest frequency on which the device operates or tunes are less than 30 MHz and which, in accordance with §15.109, is required to comply with standards on the level of radiated emissions within the frequency range 9 kHz to 30 MHz, such as a CB receiver or a device designed to conduct its radio frequency emissions via connecting wires or cables, e.g., a carrier current system not intended to radiate, shall be investigated from the lowest radio frequency generated or used in the device, without going below 9 kHz (25 MHz for CB receivers), up to the frequency shown in the following table. If the unintentional radiator contains a digital device, the upper frequency to be investigated shall be that shown in the table below or in the table in paragraph (b)(1) of this section, as based on both the highest frequency generated and the highest frequency used in the digital device, whichever range is higher.

highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30.
1.705-108	1000.
108-500	2000.
500-1000	5000.
Above 1000	5th harmonic of the highest frequency or 40 GHz, whichever is lower.

Highest frequency generated or used in the device or on which the device operates or tunes (MHz)	Upper frequency of measurement range (MHz)
Below 1.705	30
1.705-10	400
10-30	500

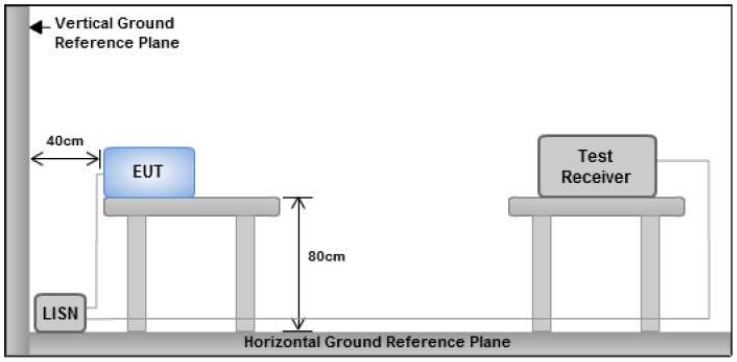
(3) Except for a CB receiver, a receiver employing superheterodyne techniques shall be investigated from 30 MHz up to at least the second harmonic of the highest local oscillator frequency generated in the device. If such receiver is controlled by a digital device, the frequency range shall be investigated up to the higher of the second harmonic of the highest local oscillator frequency generated in the device or the upper frequency of the measurement range specified for the digital device in paragraph (b)(1) of this section.

Example:

If the EUT has a transceiver operating or tunes at 2.4GHz, then both the Receiver, and the Transmitter needs to be tested separately to the Fifth Harmonic (e.g. Upper Frequency range would be 12GHz). A Transceiver consists of both a transmitter and a receiver, the receiver portion of which is always subject to the part 15 Subpart B Unintentional Radiator rules.

12. Guideline for interference allowed

12.1. AC Conducted emissions (Class A)

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>§ 15.107</td><td>a)</td><td>For a Class A digital device 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 set in following table, as measured using a 50 μH/50 ohms LISN.
Limits for Conducted Emissions at the AC Mains Ports
<table>
<tr><td rowspan="2">Section</td><td rowspan="2">Frequency ranges (MHz)</td><td colspan="2">Limit (dBuV)</td></tr>
<tr><td>QP</td><td>Average</td></tr>
<tr><td rowspan="2">Class A devices</td><td>0.15 ~ 0.5</td><td>79</td><td>66</td></tr>
<tr><td>0.5 ~ 30</td><td>73</td><td>60</td></tr>
<tr><td colspan="4">NOTE 1 The lower limit shall apply at the transition frequencies.</td></tr>
</table></td><td>Yes</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 

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</td></tr>
<tr><td>Procedure</td><td colspan="3">1. 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.
2. The power supply for the EUT was fed through a 50Ω/50ΩH EUT LISN, connected to filtered mains.
3. The RF OUT of the EUT LISN was connected to the EMI test receiver via a low-loss coaxial cable.
4. All other supporting equipment was powered separately from another main supply.
5. The EUT was switched on and allowed to warm up to its normal operating condition.
6. A scan was made on the Neutral/Phase line (for AC mains) or Earth line over the required frequency range using an EMI test receiver.
7. High peaks, relative to the limit line, were then selected.
8. The EMI test receiver was then tuned to the selected frequencies and the necessary measurements made with a receiver bandwidth setting of 10 kHz. For FCC tests, only Quasi-peak measurements were made; while for CISPR/EN tests, both Quasi-peak and Average measurements were made
9. All possible modes of operation were investigated. Only the 6 worst case emissions were measured and reported. All other emissions were relatively insignificant.</td></tr>
</table>

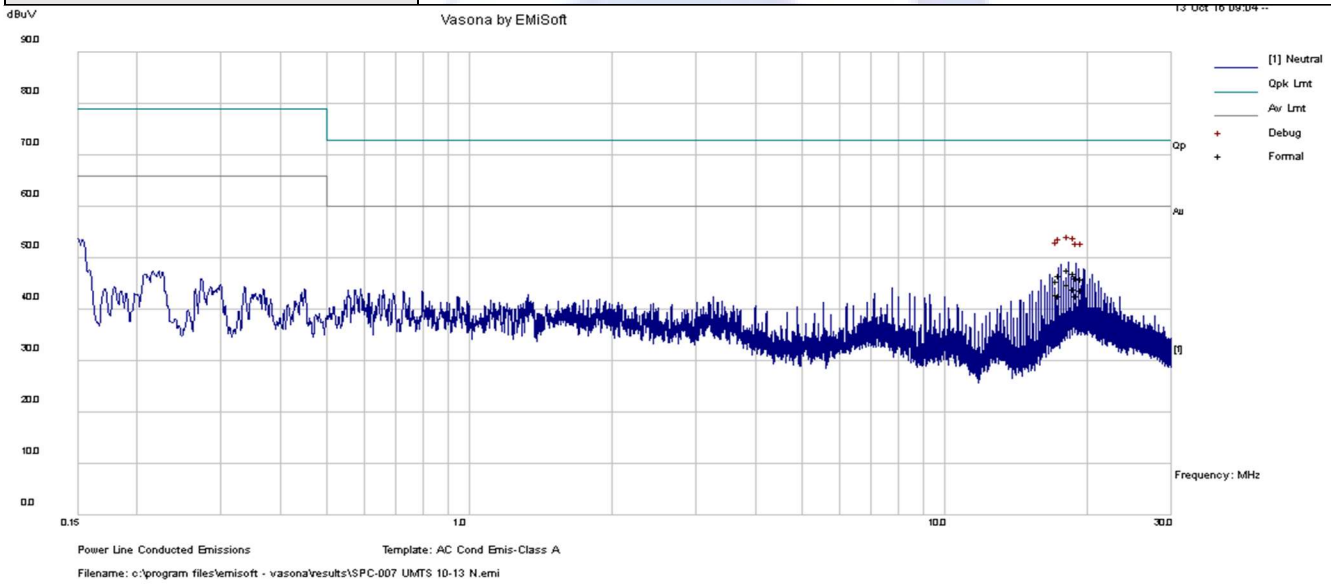
Description of the Conducted Emission Program	This EMC Measurement software, EMI Soft Vasona offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the common scan range from 15 kHz to 30 MHz; the program will first start a peak and average scan on selectable measurement time and step size. After the program complete the pre-scan, this program will perform the Quasi Peak and Average measurement, based on the pre-scan peak data reduction result.
Sample Calculation Example	At 20 MHz limit = 250 μV = 47.96 dBμV Transducer factor of LISN, pulse limiter & cable loss at 20 MHz = 11.20 dB Q-P reading obtained directly from EMI Receiver = 40.00 dBμV (Calibrated for system losses) Therefore, Q-P margin = 47.96 – 40.00 = 7.96 i.e. 7.96 dB below limit
Remarks	2 separate EUTs were used for testing in this report with 2 separate test configurations. EUT #1 was configured for Band 5 UMTS (881.5MHz) and EUT #2 was configured for Band 5 LTE (881.5MHz). Each EUT was tested individually with the tested EUT configured as the Master and non-tested EUT used for support equipment configured as the Client. EUT is powered via PoE and does not directly connect to AC Mains, therefore all data measurements presented in this section were taken on the PoE, which is connected to AC Mains.

Test Data: **X** Yes N/A

Test Plot: **X** Yes (See below) N/A

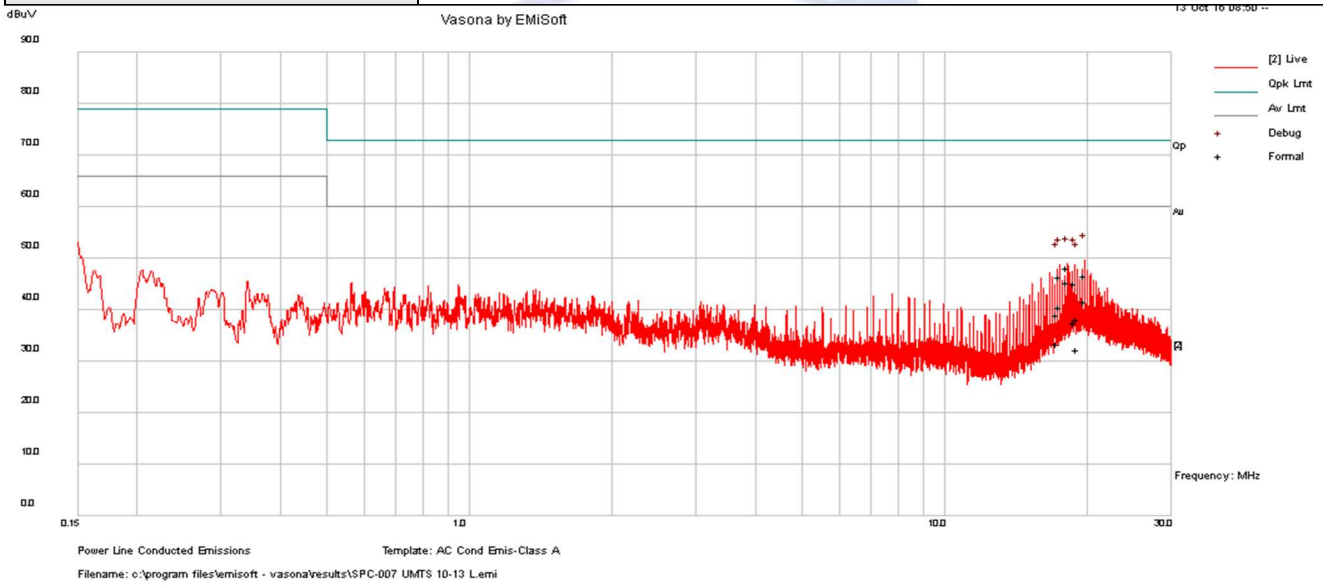
Conducted Emission Test Results per FCC 15 Subpart B (Class A)

Test specification:	AC Conducted Emissions (Class A)			
Environmental Conditions:	Temp(°C):	20.6	Result:	
	Humidity (%):	40.2		X Pass
	Atmospheric(mbar):	1015.3		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	2016-10-13			
Remarks:	EUT # 1 Band 5 UMTS 881.5MHz - Neutral			



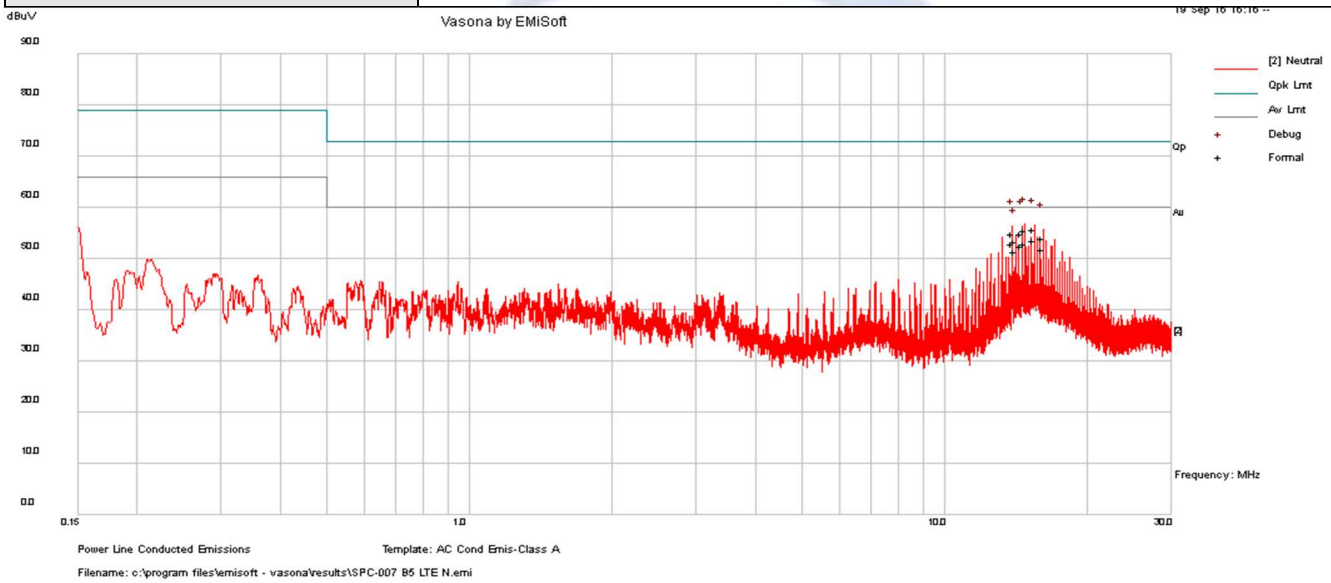
Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line/ Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
18.20	37.04	10.07	0.63	47.74	Quasi Peak	Neutral	73.00	-25.26	Pass
18.86	36.51	10.07	0.64	47.22	Quasi Peak	Neutral	73.00	-25.78	Pass
17.53	35.98	10.06	0.61	46.66	Quasi Peak	Neutral	73.00	-26.34	Pass
17.31	35.03	10.06	0.61	45.71	Quasi Peak	Neutral	73.00	-27.29	Pass
19.09	35.50	10.07	0.64	46.21	Quasi Peak	Neutral	73.00	-26.79	Pass
19.54	35.27	10.07	0.65	45.99	Quasi Peak	Neutral	73.00	-27.01	Pass
18.20	34.27	10.07	0.63	44.96	Average	Neutral	60.00	-15.04	Pass
18.86	33.32	10.07	0.64	44.02	Average	Neutral	60.00	-15.98	Pass
17.53	32.18	10.06	0.61	42.86	Average	Neutral	60.00	-17.14	Pass
17.31	32.28	10.06	0.61	42.96	Average	Neutral	60.00	-17.04	Pass
19.09	32.13	10.07	0.64	42.84	Average	Neutral	60.00	-17.16	Pass
19.54	33.10	10.07	0.65	43.82	Average	Neutral	60.00	-16.18	Pass

Test specification:	AC Conducted Emissions (Class A)			
Environmental Conditions:	Temp(°C):	20.6	Result:	
	Humidity (%):	40.2		X Pass
	Atmospheric(mbar):	1015.3		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	2016-10-13			
Remarks:	EUT # 1 Band 5 UMTS 881.5MHz - Line			



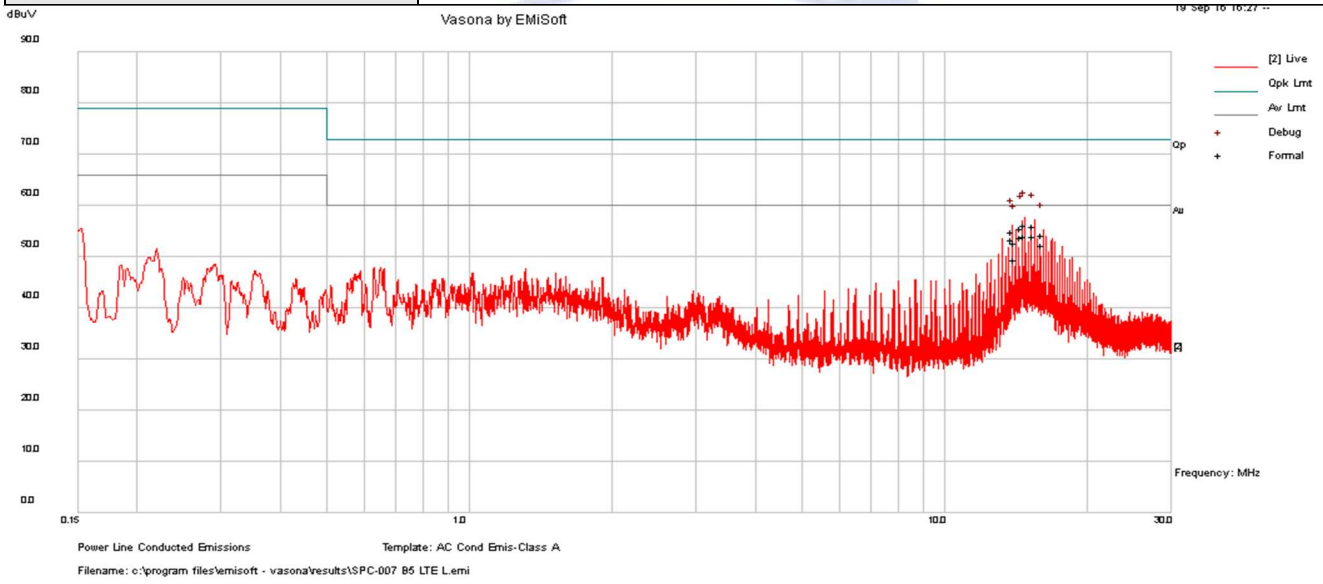
Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line/ Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
19.71	36.04	10.07	0.65	46.76	Quasi Peak	Live	73.00	-26.24	Pass
18.16	37.61	10.07	0.63	48.30	Quasi Peak	Live	73.00	-24.70	Pass
17.50	35.82	10.06	0.61	46.50	Quasi Peak	Live	73.00	-26.50	Pass
18.83	34.38	10.07	0.64	45.09	Quasi Peak	Live	73.00	-27.91	Pass
17.28	28.33	10.06	0.61	39.00	Quasi Peak	Live	73.00	-34.00	Pass
19.04	27.50	10.07	0.64	38.21	Quasi Peak	Live	73.00	-34.79	Pass
19.71	31.06	10.07	0.65	41.79	Average	Live	60.00	-18.21	Pass
18.16	34.69	10.07	0.63	45.39	Average	Live	60.00	-14.61	Pass
17.50	29.90	10.06	0.61	40.58	Average	Live	60.00	-19.42	Pass
18.83	26.91	10.07	0.64	37.62	Average	Live	60.00	-22.38	Pass
17.28	22.81	10.06	0.61	33.48	Average	Live	60.00	-26.52	Pass
19.04	21.65	10.07	0.64	32.36	Average	Live	60.00	-27.64	Pass

Test specification:	AC Conducted Emissions (Class A)			
Environmental Conditions:	Temp(°C):	21.6	Result:	
	Humidity (%):	47.1		X Pass
	Atmospheric(mbar):	1009.4		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	9/19/2016			
Remarks:	EUT # 2 Band 5 LTE 881.5MHz - Neutral			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line/ Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
14.77	44.91	10.06	0.56	55.52	Quasi Peak	Neutral	73.00	-17.48	Pass
15.43	45.13	10.06	0.57	55.76	Quasi Peak	Neutral	73.00	-17.24	Pass
14.54	44.34	10.06	0.56	54.95	Quasi Peak	Neutral	73.00	-18.05	Pass
13.87	44.25	10.06	0.55	54.85	Quasi Peak	Neutral	73.00	-18.15	Pass
16.11	43.39	10.06	0.58	54.04	Quasi Peak	Neutral	73.00	-18.96	Pass
14.09	42.82	10.06	0.55	53.43	Quasi Peak	Neutral	73.00	-19.57	Pass
14.77	42.28	10.06	0.56	52.90	Average	Neutral	60.00	-7.10	Pass
15.43	43.12	10.06	0.57	53.75	Average	Neutral	60.00	-6.25	Pass
14.54	42.03	10.06	0.56	52.64	Average	Neutral	60.00	-7.36	Pass
13.87	42.41	10.06	0.55	53.02	Average	Neutral	60.00	-6.98	Pass
16.11	41.36	10.06	0.58	52.01	Average	Neutral	60.00	-7.99	Pass
14.09	40.81	10.06	0.55	51.42	Average	Neutral	60.00	-8.58	Pass

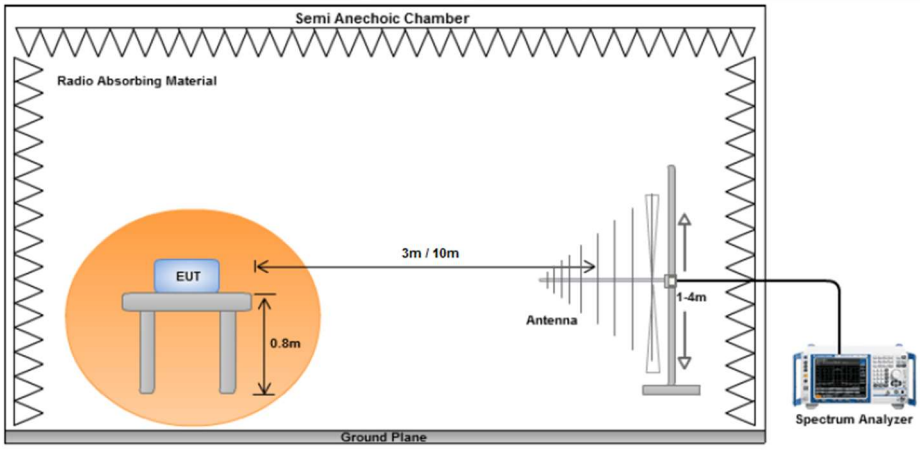
Test specification:	AC Conducted Emissions (Class A)			
Environmental Conditions:	Temp(°C):	21.6	Result:	
	Humidity (%):	47.1		X Pass
	Atmospheric(mbar):	1009.4		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	9/19/2016			
Remarks:	EUT # 2 Band 5 LTE 881.5MHz - Line			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	Factors (dB)	Level (dBuV)	Measurement Type	Line/ Neutral	Limit (dBuV)	Margin (dB)	Pass /Fail
14.77	45.59	10.06	0.56	56.21	Quasi Peak	Live	73.00	-16.79	Pass
15.43	45.47	10.06	0.57	56.10	Quasi Peak	Live	73.00	-16.90	Pass
14.54	44.88	10.06	0.56	55.49	Quasi Peak	Live	73.00	-17.51	Pass
13.87	44.32	10.06	0.55	54.93	Quasi Peak	Live	73.00	-18.07	Pass
16.10	43.71	10.06	0.58	54.36	Quasi Peak	Live	73.00	-18.64	Pass
14.09	42.27	10.06	0.55	52.88	Quasi Peak	Live	73.00	-20.12	Pass
14.77	43.47	10.06	0.56	54.09	Average	Live	60.00	-5.91	Pass
15.43	43.45	10.06	0.57	54.08	Average	Live	60.00	-5.92	Pass
14.54	43.26	10.06	0.56	53.88	Average	Live	60.00	-6.12	Pass
13.87	42.72	10.06	0.55	53.32	Average	Live	60.00	-6.68	Pass
16.10	41.76	10.06	0.58	52.41	Average	Live	60.00	-7.59	Pass
14.09	38.85	10.06	0.55	49.46	Average	Live	60.00	-10.54	Pass

12.2. Radiated Spurious Emissions Below 1GHz (Class A)

Requirement(s):

<table>
<tr><th>Spec</th><th>Item</th><th>Requirement</th><th>Applicable</th></tr>
<tr><td>§ 15.109</td><td>a)</td><td>The field strength of radiated emissions from a Class A digital device, as determined at a distance of 10 meters, shall not exceed the following:
<table>
<tr><th>Frequency range (MHz)</th><th>Field Strength (uV/m)</th></tr>
<tr><td>30 – 88</td><td>100</td></tr>
<tr><td>88 – 216</td><td>150</td></tr>
<tr><td>216 960</td><td>210</td></tr>
<tr><td>Above 960</td><td>300</td></tr>
</table></td><td>Yes</td></tr>
<tr><td>Test Setup</td><td colspan="3"> 
</td></tr>
<tr><td>Procedure</td><td colspan="3">1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table
2. The EUT was switched on and allowed to warm up to its normal operating condition.
3. 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.
4. A Quasi-peak measurement was then made for that frequency point.
5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured.
6. The frequency range covered was from 30MHz to 1GHz using the broadband antenna.</td></tr>
<tr><td>Description of the Radiated Emissions Program</td><td colspan="3">This EMC Measurement software, EMI Soft Vasona offers a common user interface for electromagnetic interference (EMI) measurements. This software is a modern and powerful tool for controlling and monitoring EMI test receivers and EMC test systems. It guarantees reliable collection, evaluation, and documentation of measurement results. Basically, this program will run a pre-scan measurement before it proceeds with the final measurement. The pre-scan routine will run the scan on four different antenna heights, 2 antenna polarity, and 360 degrees table rotation. For example, the program was set to run 30 MHz to 1 GHz scan; the program will first start from a meter antenna height and divide the 30 MHz to 1 GHz into 10 separate parts of maximum hold sweeps. Each parts of maximum hold sweep, the program will collect the data from 0 degree to 360 degrees table rotation. After the program complete the 1m scan, the antenna continues to rise to 2m and continue the scan. The step will repeated for all specified antenna height and polarity. This program will perform the Quasi Peak measurement after the signal maximization process and pre-scan routine. The final measurement will be based on the pre-scan data reduction result.</td></tr>
</table>

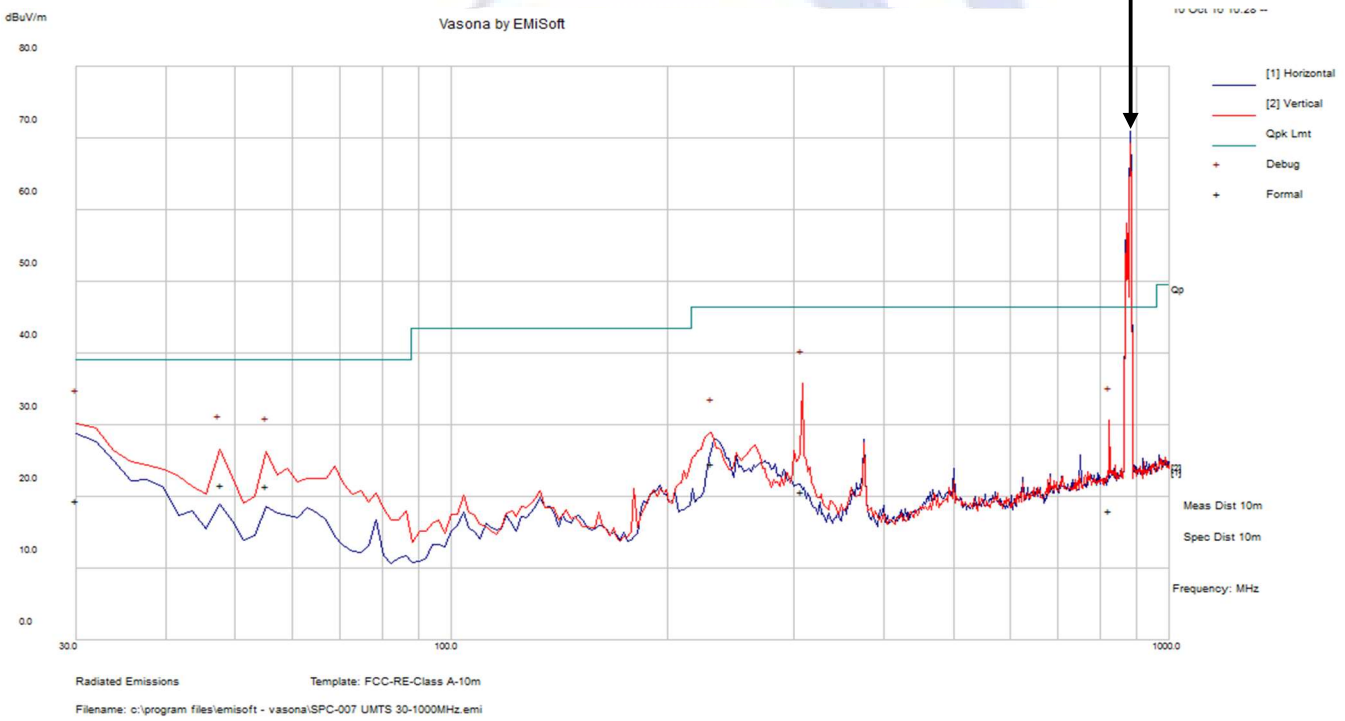
Sample Calculation Example	At 300 MHz limit = 200 µV/m = 46.00 dBµV/m Log-periodic antenna factor & cable loss at 300 MHz = 18.50 dB Q-P reading obtained directly from EMI Receiver = 40.00 dBµV/m (Calibrated level including antenna factors & cable losses Therefore, Q-P margin = 46.00 – 40.00 = 6.00 i.e. 6 dB below limit
Remarks	2 separate EUTs were used for testing in this report with 2 separate test configurations. EUT #1 was configured for Band 5 UMTS (881.5MHz) and EUT #2 was configured for Band 5 LTE (881.5MHz). Each EUT was tested individually with the tested EUT configured as the Master and non-tested EUT used for support equipment configured as the Client. Only the EUT under test was located inside the test chamber, all other support equipment was located remotely in the control room.

Test Data: **X** Yes (See below) N/A

Test Data: **X** Yes (See below) N/A

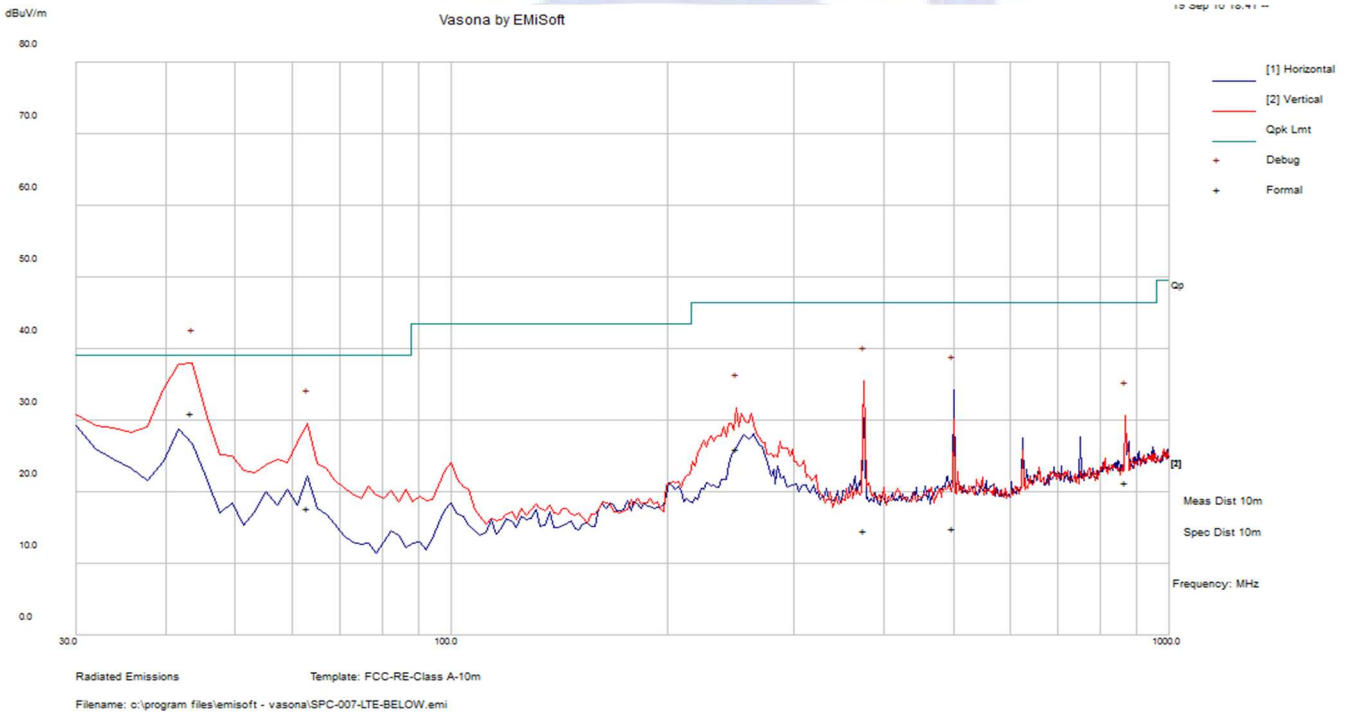
Radiated Emission Test Results (Below 1GHz, Class A)

Test specification:	Radiated Emissions (Below 1GHz)			
Environmental Conditions:	Temp(°C):	22.7	Result:	
	Humidity (%):	41.5		X Pass
	Atmospheric(mbar):	1012.7		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	2016-10-10			
Remarks:	EUT # 1 Band 5 UMTS 881.5MHz - 30 - 1000MHz at 10m distance (881.5MHz is a configured TX radio frequency)			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
30.00	34.53	0.87	-15.88	19.51	Quasi Max	V	203.00	127.00	39.08	-19.57	Pass
308.00	43.75	2.61	-25.73	20.62	Quasi Max	V	102.00	6.00	46.44	-25.82	Pass
47.74	49.64	1.12	-29.10	21.66	Quasi Max	V	346.00	357.00	39.08	-17.42	Pass
55.27	51.27	1.19	-30.93	21.52	Quasi Max	V	283.00	230.00	39.08	-17.56	Pass
824.92	31.21	4.43	-17.54	18.11	Quasi Max	V	370.00	150.00	46.44	-28.33	Pass
230.39	50.67	2.28	-28.40	24.54	Quasi Max	V	109.00	19.00	46.44	-21.90	Pass

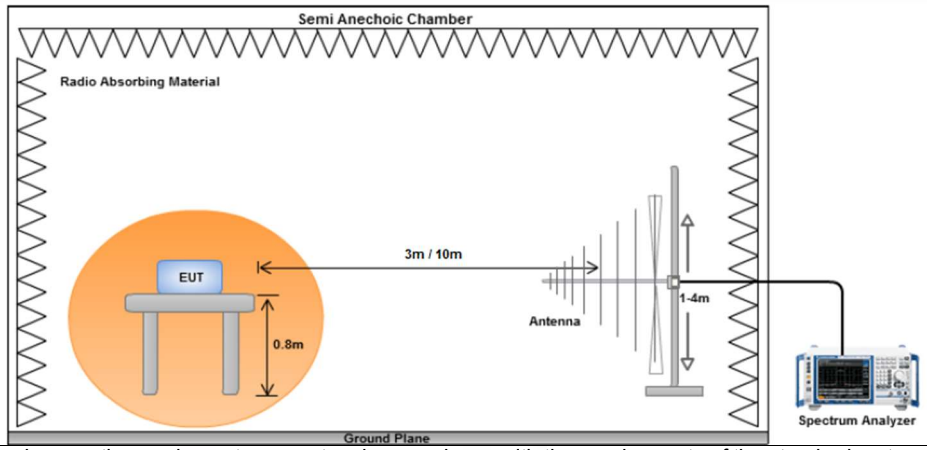
Test specification:	Radiated Emissions (Below 1GHz)			
Environmental Conditions:	Temp(°C):	21.6	Result:	
	Humidity (%):	47.1		X Pass
	Atmospheric(mbar):	1009.4		
Mains Power:	120V 60Hz			
Tested by:	Gary Chou			Fail
Test Date:	9/19/2016			
Remarks:	EUT # 2 Band 5 LTE 881.5MHz - 30 - 1000MHz at 10m distance			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
43.36	56.29	1.14	-26.40	31.03	Quasi Max	V	109.00	221.00	39.08	-8.05	Pass
63.02	47.52	1.36	-31.20	17.68	Quasi Max	V	278.00	4.00	39.08	-21.40	Pass
376.16	36.10	3.25	-24.70	14.66	Quasi Max	V	294.00	94.00	46.44	-31.78	Pass
500.50	32.68	3.77	-21.48	14.97	Quasi Max	H	376.00	231.00	46.44	-31.47	Pass
249.66	51.57	2.59	-28.08	26.08	Quasi Max	V	138.00	10.00	46.44	-20.36	Pass
867.57	33.60	5.02	-17.30	21.32	Quasi Max	V	302.00	225.00	46.44	-25.12	Pass

12.3. Radiated Spurious Emissions above 1GHz (Class A)

Requirement(s):

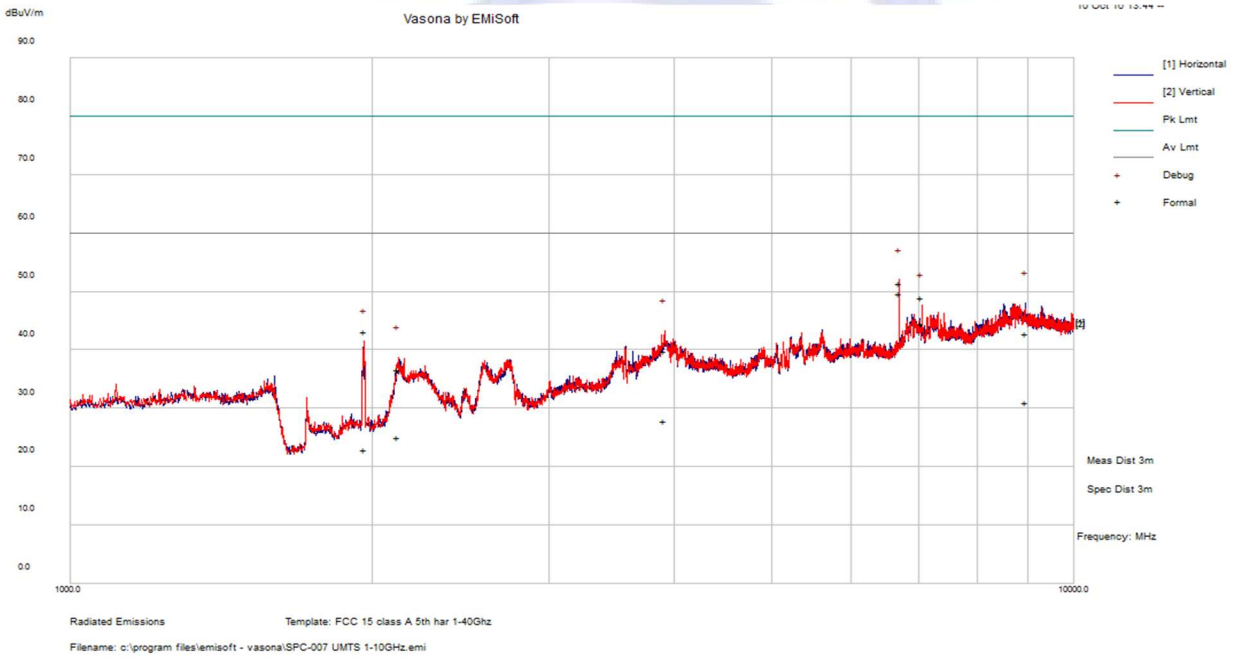
Spec	Item	Requirement	Applicable
§ 15.109	a)	The field strength of radiated emissions from a Class A digital device, as determined at a distance of 3 meters, shall not exceed the following: **Frequency range (GHz)** / **Average limit dB(uV/m)** / **Peak limit dB(uV/m)** Above 1 / 60 / 80	Yes
Test Setup			
Procedure	1. The EUT and supporting equipment were set up in accordance with the requirements of the standard on top of a 1.5m X 1.0m X 0.8m high, non-metallic table 2. The EUT was switched on and allowed to warm up to its normal operating condition. 3. 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. 4. A Peak and Average measurement was then made for that frequency point. 5. Steps 3 and 4 were repeated for the next frequency point, until all selected frequency points were measured. 6. The frequency range covered was from 1GHz to 6GHz (for FCC tests, until the 5th harmonic for operating frequencies ≥ 1000MHz) using a horn antenna.		
Remarks	2 separate EUTs were used for testing in this report with 2 separate test configurations. EUT #1 was configured for Band 5 UMTS (881.5MHz) and EUT #2 was configured for Band 5 LTE (881.5MHz). Each EUT was tested individually with the tested EUT configured as the Master and non-tested EUT used for support equipment configured as the Client. Only the EUT under test was located inside the test chamber, all other support equipment was located remotely in the control room. Both EUTs were investigated up to the 5th harmonic of Band 2 LTE (1960MHz), testing up to 10GHz.		

Test Data: **X** Yes (See below) N/A

Test Data: **X** Yes (See below) N/A

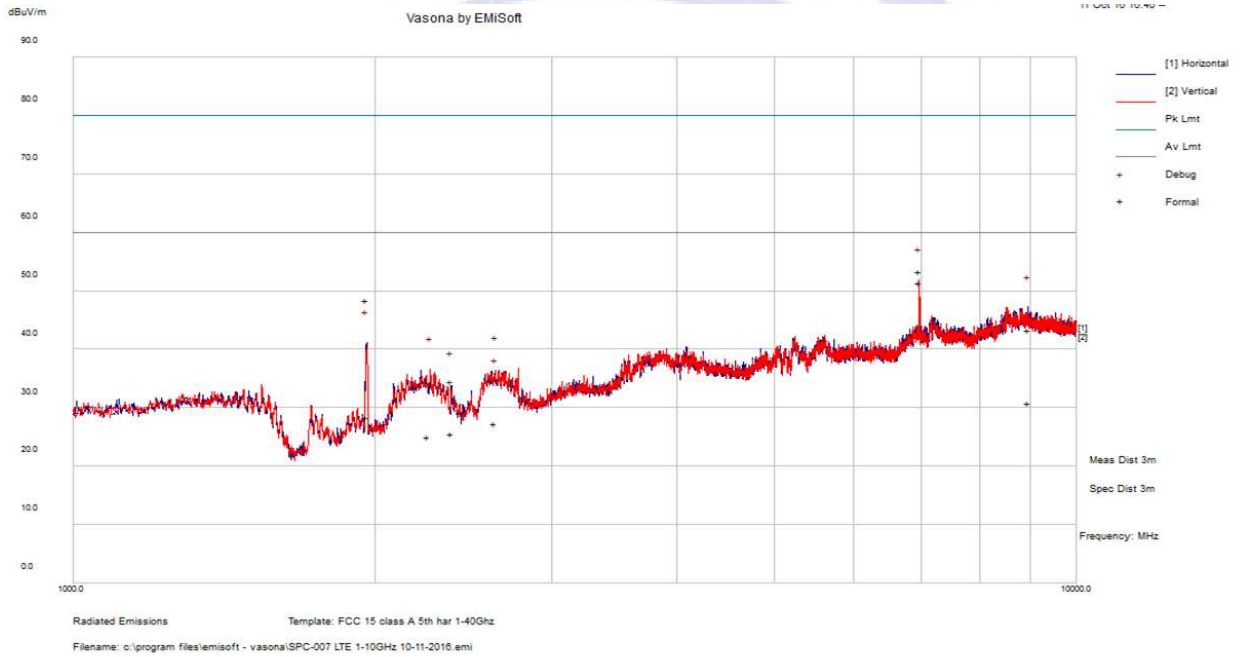
Radiated Emission Test Results (Above 1GHz, Class A)

Test specification:	Radiated Emissions (Above 1GHz)			
Environmental Conditions:	Temp(°C):	22.7	Result:	
	Humidity (%):	41.5		X Pass
	Atmospheric(mbar):	1012.7		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	2016-10-10			
Remarks:	EUT # 1 Band 5 UMTS 881.5MHz - 1 – 10GHz at 3m distance			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
6692.76	47.17	5.56	-1.31	51.41	Peak Max	V	150.00	2.00	80.00	-28.59	Pass
8946.13	35.22	7.21	0.42	42.86	Peak Max	H	195.00	242.00	80.00	-37.14	Pass
7052.69	43.62	5.81	-0.46	48.97	Peak Max	V	117.00	323.00	80.00	-31.03	Pass
3907.32	41.11	4.59	-5.97	39.73	Peak Max	V	294.00	227.00	80.00	-40.27	Pass
1961.79	51.95	3.23	-11.96	43.22	Peak Max	V	167.00	327.00	80.00	-36.79	Pass
2121.19	45.07	3.33	-11.73	36.67	Peak Max	V	314.00	229.00	80.00	-43.33	Pass
6692.76	45.39	5.56	-1.31	49.64	Average	V	150.00	2.00	60.00	-10.36	Pass
8946.13	23.33	7.21	0.42	30.96	Average	H	195.00	242.00	60.00	-29.04	Pass
7052.69	39.15	5.81	-0.46	44.50	Average	V	117.00	323.00	60.00	-15.50	Pass
3907.32	29.21	4.59	-5.97	27.83	Average	V	294.00	227.00	60.00	-32.17	Pass
1961.79	31.71	3.23	-11.96	22.98	Average	V	167.00	327.00	60.00	-37.02	Pass
2121.19	33.40	3.33	-11.73	25.00	Average	V	314.00	229.00	60.00	-35.00	Pass

Test specification:	Radiated Emissions (Above 1GHz)			
Environmental Conditions:	Temp(°C):	21.4	Result:	
	Humidity (%):	46.6		X Pass
	Atmospheric(mbar):	1016.0		
Mains Power:	120V 60Hz			
Tested by:	Bryan Smith			Fail
Test Date:	2016-10-11			
Remarks:	EUT # 2 Band 5 LTE 881.5MHz - 1 – 10GHz at 3m distance			



Frequency (MHz)	Raw (dBuV)	Cable Loss (dB)	AF (dB)	Level (dBuV/m)	Measurement Type	Pol	Hgt (cm)	Azt (Deg)	Limit (dBuV/m)	Margin (dB)	Pass /Fail
6971.87	47.93	5.76	-0.32	53.37	Peak Max	V	106.00	40.00	80.00	-26.63	Pass
8946.06	35.71	7.21	0.42	43.34	Peak Max	H	176.00	280.00	80.00	-36.66	Pass
1960.17	57.23	3.23	-11.97	48.48	Peak Max	H	215.00	120.00	80.00	-31.52	Pass
2637.54	42.88	3.63	-10.57	35.94	Peak Max	V	313.00	134.00	80.00	-44.06	Pass
2267.46	41.65	3.41	-11.75	33.31	Peak Max	V	167.00	219.00	80.00	-46.69	Pass
2380.85	42.54	3.46	-11.67	34.33	Peak Max	H	224.00	304.00	80.00	-45.67	Pass
6971.87	45.94	5.76	-0.32	51.38	Average	V	106.00	40.00	60.00	-8.62	Pass
8946.06	23.15	7.21	0.42	30.79	Average	H	176.00	280.00	60.00	-29.21	Pass
1960.17	37.14	3.23	-11.97	28.40	Average	H	215.00	120.00	60.00	-31.60	Pass
2637.54	34.38	3.63	-10.57	27.44	Average	V	313.00	134.00	60.00	-32.56	Pass
2267.46	33.28	3.41	-11.75	24.94	Average	V	167.00	219.00	60.00	-35.06	Pass
2380.85	33.86	3.46	-11.67	25.65	Average	H	224.00	304.00	60.00	-34.35	Pass

13. Annex A | Test instruments and method

Instrument	Model	Serial #	Cal Cycle	Cal Due	In use
Conducted Emissions					
EMI Test Receiver (9kHz - 6GHz)	ESL6	100178	1 Year	8/17/2017	Yes
Transient Limiter (9kHz - 100MHz)	EM-7600	287	1 Year	4/7/2017	Yes
V-LISN (150 kHz - 30 MHz)	NNLK 8129	8129-190	1 Year	8/4/2017	Yes
LISN (9kHz - 30MHz)	MN2050B	1018	1 Year	8/16/2017	Yes
ISN T8	ISN T800	30814	1 Year*	9/23/2016*	No
ISN T8 CAT 6	D-12623	38906	1 Year	12/3/2016	No
Radiated Emissions					
EMI Test Receiver	ESIB 40	100179	1 Year	6/8/2017	Yes
EXA Signal Analyzer (20Hz - 26.5GHz)	N9010A	MY50210206	1 Year	10/27/2016	No
MXA Signal Analyzer (20Hz - 26.5GHz)	N9020A	MY51240100	1 Year	10/1/2016	No
Keysight EXA 44 GHz Spectrum Analyzer	N9010A	MY51440112	1 Year	8/2/2017	Yes
Antenna - Biconlog (30MHz - 2GHz)	JB1	A030702	1 Year	7/8/2017	Yes
Double Ridged Waveguide Horn Antenna (1 - 18 GHz)	3115	10SL0059	1 Year	8/11/2017	Yes
Horn Antenna (700MHz - 18GHz)	SAS-571	411	1 Year	4/4/2017	No
Horn Antenna (18 - 40GHz)	AH-840	101013	1 Year	7/15/2017	No
RF Pre-Amplifier (9kHz - 6.5GHz)	LPA-6-30	11140711	1 Year	2/10/2017	Yes
Pre-Amplifier (1 - 26.5GHz)	8449B	3008A00715	1 Year	3/30/2017	No
Pre-Amplifier (1 - 40GHz)	J532-00104000-58-5P	1960351	1 Year	5/10/2017	Yes
2.4GHz Notch Filter	BRM50702	116	1 Year	3/28/2017	No
5GHz Notch Filter	BRM50705	41	1 Year*	9/11/2016*	No

5GHz Notch Filter	BRM50716	072	1 Year*	9/11/2016*	No
2.4GHz Notch Filter	BRM50702	G242	1 Year	4/14/2017	No
5.7GHz Notch Filter	BRC50705	G093	1 Year	4/14/2017	No
10 Meters SAC	10M	N/A	1 Year	7/6/2017	Yes

14. 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 EM, 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