



FCC PART 15, SUBPART C
ISED C RSS-247, ISSUE 2, FEBRUARY 2017

TEST REPORT

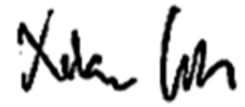
For

Samsung Electronics Co., Ltd.

19 Chapin Rd., Building D,

Pine Brook, NJ 07058, USA

FCC ID: A3LSIP005AFS30
IC: 649E-SIP005AFS30

Report Type: Class II Permissive Change	Product Type: System-on-Module
Prepared By: Chin Ming Lui Test Engineer	
Report Number: R1709282-247-Wi-Fi-BLE	
Report Date: 2017-10-19	
Reviewed By: Xiao Lin Test Engineer	
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Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report **must not** be used by the customer to claim product certification, approval, or endorsement by A2LA*, NIST, or any agency of the Federal Government.

* This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk “*” (Rev. 0)

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1709282-247-Wi-Fi-BLE	Original	2017-10-19

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report was prepared on behalf of *Samsung Electronics Co Ltd., and their product model: SIP005AFS3, FCC ID: A3LSIP005AFS30, IC: 649E-SIP005AFS30* or the “EUT” as referred to in this report. The product is a System-on-Module.

Note: Customer confirms that Zigbee works with another antenna port and will not be installed with Molex 47950-0001 antenna.

1.2 Objective

This report is prepared on behalf of *Samsung Electronics Co Ltd.*, in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission’s rules and ISED RSS-247 Issue 2, February 2017.

The objective is to determine compliance with FCC Part 15.247 and ISED RSS-247 rules for Output Power, Antenna Requirements, 6 dB Bandwidth, Power Spectral Density, 100 kHz Bandwidth of Band Edges Measurement, Conducted and Radiated Spurious Emissions.

This project is a Permissive Change II submission for the purpose of Adding Molex 47950-0001 Antenna.

1.3 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment DSS with FCC ID: A3LSIP005AFS30, IC: 649E-SIP005AFS30
FCC Part 15, Subpart E, Equipment NII with FCC ID: A3LSIP005AFS30, IC: 649E-SIP005AFS30

1.4 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2013, American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices and FCC KDB 558074 D01 DTS Meas Guidance v04: Guidance for Performing Compliance Measurements on Digital Transmission Systems (DTS) Operating Under §15.247.

1.5 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Power Spectral Density, conducted	±1.48dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 ° C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.6 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3279.02), in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices,

Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body

- - For the USA (Federal Communications Commission):

- 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
- 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
- 3- All Telephone Terminal Equipment within FCC Scope C.

- For the Canada (Industry Canada):

- 1- All Scope 1-Licence-Exempt Radio Frequency Devices;
- 2- All Scope 2-Licensed Personal Mobile Radio Services;
- 3- All Scope 3-Licensed General Mobile & Fixed Radio Services;
- 4- All Scope 4-Licensed Maritime & Aviation Radio Services;
- 5- All Scope 5-Licensed Fixed Microwave Radio Services
- 6- All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.

For Singapore (Info-Communications Development Authority (IDA)):

- 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2

- For the Hong Kong Special Administrative Region:

- 1 All Radio Equipment, per KHCA 10XX-series Specifications;
- 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
- 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.

- For Japan:

- 1 MIC Telecommunication Business Law (Terminal Equipment):
 - All Scope A1 - Terminal Equipment for the Purpose of Calls;
 - All Scope A2 - Other Terminal Equipment
- 2 Radio Law (Radio Equipment):
 - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
 - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
 - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3279.01) to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

- 1 Electronics and Office Equipment:
 - for Telephony (ver. 3.0)
 - for Audio/Video (ver. 3.0)
 - for Battery Charging Systems (ver. 1.1)
 - for Set-top Boxes & Cable Boxes (ver. 4.1)
 - for Televisions (ver. 6.1)
 - for Computers (ver. 6.0)
 - for Displays (ver. 6.0)
 - for Imaging Equipment (ver. 2.0)
 - for Computer Servers (ver. 2.0)
- 2 Commercial Food Service Equipment
 - for Commercial Dishwashers (ver. 2.0)
 - for Commercial Ice Machines (ver. 2.0)
 - for Commercial Ovens (ver. 2.1)

- for Commercial Refrigerators and Freezers
- 3 Lighting Products
 - For Decorative Light Strings (ver. 1.5)
 - For Luminaires (including sub-components) and Lamps (ver. 1.2)
 - For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
 - For Integral LED Lamps (ver. 1.4)
- 4 Heating, Ventilation, and AC Products
 - for Residential Ceiling Fans (ver. 3.0)
 - for Residential Ventilating Fans (ver. 3.2)
- 5 Other
 - For Water Coolers (ver. 3.0)

D. A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Industry Canada - IC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
 - o BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
 - o NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
 - o EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
 - o Radio & Teleterminal Equipment (R&TTE) Directive 1995/5/EC US -EU EMC & Telecom MRA CAB (NB)
 - o Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
 - o Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Development Authority - IDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter
- USA:
 - o ENERGY STAR Recognized Test Laboratory – US EPA
 - o Telecommunications Certification Body (TCB) – US FCC;
 - o Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.10-2013 and FCC KDB 558074 D01 DTS Meas Guidance v04.

2.2 EUT Exercise Software

The test firmware used was Marvell 8997 Labtool provided by *Whisker Labs, Inc.* The software is compliant with the standard requirements being tested against.

2.3 Equipment Modifications

No modifications to the EUT were made.

2.4 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410
Netgear	Router	WNR2020

2.5 Support Equipment

There was no support equipment included, or intended for use with EUT during these tests.

2.6 Interface Ports and Cabling

Cable Description	Length (m)	To	From
Ethernet Cable	2 m	Laptop	Router
Ethernet Cable	7 m	Router	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC and ISED Rules	Description of Test	Results
FCC §15.203 ISED RSS-Gen Clause 8.3	Antenna Requirement	Compliant
FCC §2.1091, §15.247(i) ISED RSS-102	RF Exposure	Compliant ¹
FCC §2.1053, §15.205, §15.209, §15.247 (d) ISED RSS-247 Clause 5.5 ISED RSS-Gen Clause 8.9 and 8.10	Radiated Spurious Emissions	Compliant

Note¹: Please refer to BACL report number: R1709282-MPE.

4 FCC §15.203 & ISEDC RSS-Gen Clause 8.3 - Antenna Requirements

4.1 Applicable Standards

According to FCC §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. The use of a permanently attached antenna or of an antenna that uses a unique coupling to the intentional radiator shall be considered sufficient to comply with the provisions of this Section. The manufacturer may design the unit so that a broken antenna can be replaced by the user, but the use of a standard antenna jack or electrical connector is prohibited.

And according to FCC §15.247 (b) (4), if transmitting antennas of directional gain greater than 6 dBi are used the power shall be reduced by the amount in dB that the directional gain of the antenna exceeds 6 dBi.

According to ISEDC RSS-Gen Clause 8.3: Transmitter Antenna

The applicant for equipment certification, as per RSP-100, must provide a list of all antenna types that may be used with the license-exempt transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna.

License-exempt transmitters that have received equipment certification may operate with different types of antennas. However, it is not permissible to exceed the maximum equivalent isotopically radiated power (e.i.r.p.) limits specified in the applicable standard (RSS) for the license-exempt apparatus.

Testing shall be performed using the highest gain antenna of each combination of license-exempt transmitter and antenna type, with the transmitter output power set at the maximum level.⁹ When a measurement at the antenna connector is used to determine RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna manufacturer.

User manuals for transmitters equipped with detachable antennas shall also contain the following notice in a conspicuous location:

This radio transmitter (identify the device by certification number) has been approved by Industry Canada to operate with the antenna types listed below with the maximum permissible gain indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types approved for use with the transmitter, indicating the maximum permissible antenna gain (in dBi).

4.2 Antenna Description

The antennas used by the EUT are permanent attached antennas.

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Wi-Fi/Bluetooth	2400-2500	3.0
Wi-Fi	5180-5825	4.6

5 FCC §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

5.1 Applicable Standards

As per FCC §15.35(d): Unless otherwise specified, on any frequency or frequencies above 1000 MHz, the radiated emission limits are based on the use of measurement instrumentation employing an average detector function. Unless otherwise specified, measurements above 1000 MHz shall be performed using a minimum resolution bandwidth of 1 MHz.

As Per FCC §15.205(a) and RSS-Gen except as show in paragraph (d) of this section, only spurious emissions are permitted in any of the frequency bands listed below:

MHz	MHz	MHz	GHz
0.090 – 0.110	16.42 – 16.423	960 – 1240	4.5 – 5.15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5.35 – 5.46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 – 167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3.3458 – 3.358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): 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

Frequency (MHz)	Field Strength (micro volts/meter)	Measurement Distance (meters)
0.009 - 0.490	2400/F(kHz)	300
0.490 - 1.705	24000/F(kHz)	30
1.705 - 30.0	30	30
30 - 88	100**	3
88 - 216	150**	3
216 - 960	200**	3
Above 960	500	3

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz.

However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d), 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 below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of RMS averaging over a time interval, as permitted under paragraph (b)(3) of this section, the attenuation required under this paragraph shall be 30 dB instead of 20 dB. Attenuation below the general limits specified in §15.209(a) is not required. In addition, radiated emissions which fall in the restricted bands, as defined in §15.205(a), must also comply with the radiated emission limits specified in §15.209(a) (see §15.205(c)).

As per ISED RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emissions from licence-exempt transmitters shall comply with the field strength limits shown in Table 4 or Table 5 below. Additionally, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

Table 4 – General Field Strength Limits for Licence-Exempt Transmitters at Frequencies Above 30 MHz

Frequency (MHz)	Field Strength ($\mu\text{V/m}$ at 3 metres)
30-88	100
88-216	150
216-960	200
Above 960*	500

* Unless otherwise specified, for all frequencies greater than 1 GHz, the radiated emission limits for license-exempt radio apparatus stated in applicable RSSs (including RSS-Gen) are based on measurements using a linear average detector function having a minimum resolution bandwidth of 1 MHz. If an average limit is specified for the EUT, then the peak emission shall also be measured with instrumentation properly adjusted for such factors as pulse desensitization to ensure the peak emission is less than 20 dB above the average limit.

Note: Transmitting devices are not permitted in restricted frequency bands unless stated otherwise in the specific RSS.

As per ISED RSS-247 §5.5, in any 100 kHz bandwidth outside the frequency band in which the spread spectrum or digitally modulated device is operating, the RF power that is produced shall be at least 20 dB below that in the 100 kHz bandwidth within the band that contains the highest level of the desired power, based on either an RF conducted or a radiated measurement, provided that the transmitter demonstrates compliance with the peak conducted power limits. If the transmitter complies with the conducted power limits based on the use of root-mean-square averaging over a time interval, as permitted under Section 5.4(4), the attenuation required shall be 30 dB instead of 20 dB. Attenuation below the general field strength limits specified in RSS-Gen is not required.

5.2 Test Setup

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2013. The specification used was the FCC 15 Subpart C and ISEDC RSS-247 limits.

The spacing between the peripherals was 10 centimeters.

External I/O cables were draped along the edge of the test table and bundle when necessary.

5.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords were connected to the AC floor outlet.

Maximizing procedure was performed on the highest emissions to ensure that the EUT complied with all installation combinations.

The EUT was set 3 meter away from the testing antenna, which was varied from 1-4 meter, and the EUT was placed on a turntable, which was 0.8 meter and 1.5 meter above the ground plane for below and above 1000 MHz measurements, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna's polarity should be changed between horizontal and vertical.

The spectrum analyzer or receiver was set as:

Below 1000 MHz:

$$\text{RBW} = 100 \text{ kHz} / \text{VBW} = 300 \text{ kHz} / \text{Sweep} = \text{Auto}$$

Above 1000 MHz:

(1) Peak: $\text{RBW} = 1\text{MHz} / \text{VBW} = 1\text{MHz} / \text{Sweep} = \text{Auto}$

(2) Average: $\text{RBW} = 1\text{MHz} / \text{VBW} = 10\text{Hz} / \text{Sweep} = \text{Auto}$

5.4 Corrected Amplitude and Margin Calculation

The Corrected Amplitude (CA) is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) to indicated Amplitude (Ai) reading. The basic equation is as follows:

$$\text{CA} = \text{Ai} + \text{AF} + \text{CL} + \text{Atten} - \text{Ga}$$

For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

The “**Margin**” column of the following data tables indicates the degree of compliance within the applicable limit. For example, a margin of -7 dB means the emission is 7 dB below the maximum limit. The equation for margin calculation is as follows:

$$\text{Margin} = \text{Corrected Amplitude} - \text{Limit}$$

5.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	Receiver, EMI Test	ESCI 1166.5950K03	100338	2016-02-04	2 years
Agilent	Analyzer, Spectrum	E4440A	US42221851	2017-08-14	1 year
Sunol Sciences	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Antenna, Biconi-Log	JB1	A013105-3	2015-07-11	28 months
EMCO	Antenna, Horn	3115	9511-4627	2016-01-28	2 years
Agilent	Amplifier, Pre	8447D	2944A07030	2017-05-17	1 year
IW	AOBOR Hi frequency Co AX Cable	KPS-1501N-3960- KPS	-	2017-04-27	1 year
-	SMA cable	-	C0002	Each time ¹	N/A
-	N-Type Cable	-	C00012	Each time ¹	N/A
-	N-Type Cable	-	C00014	Each time ¹	N/A
Agilent	Pre-Amplifier	8449B	3147A00400	2017-06-15	1 year
Sunol Sciences	Antenna, Horn	DRH-118	A052704	2017-03-27	2 years
A.R.A.	Antenna, Horn	DRG-118/A	1132	2015-09-21	26 months
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note¹: cable and attenuator included in the test set-up will be checked each time before testing.

Statement of Traceability: **BACL Corp.** attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".

5.6 Test Environmental Conditions

Temperature:	20-22 °C
Relative Humidity:	42-50 %
ATM Pressure:	102.7 kPa

The testing was performed by Chin Ming Lui & Jin Yang from 2017-09-28 to 2017-10-05 in 5m chamber 3.

5.7 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC Title 47, Part 15C and ISEDC RSS-247 standard's radiated emissions limits, and had the worst margin of:

2.4 GHz Wi-Fi

Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	Mode, channel
-1.23	2390	Vertical	g mode, low channel

BLE

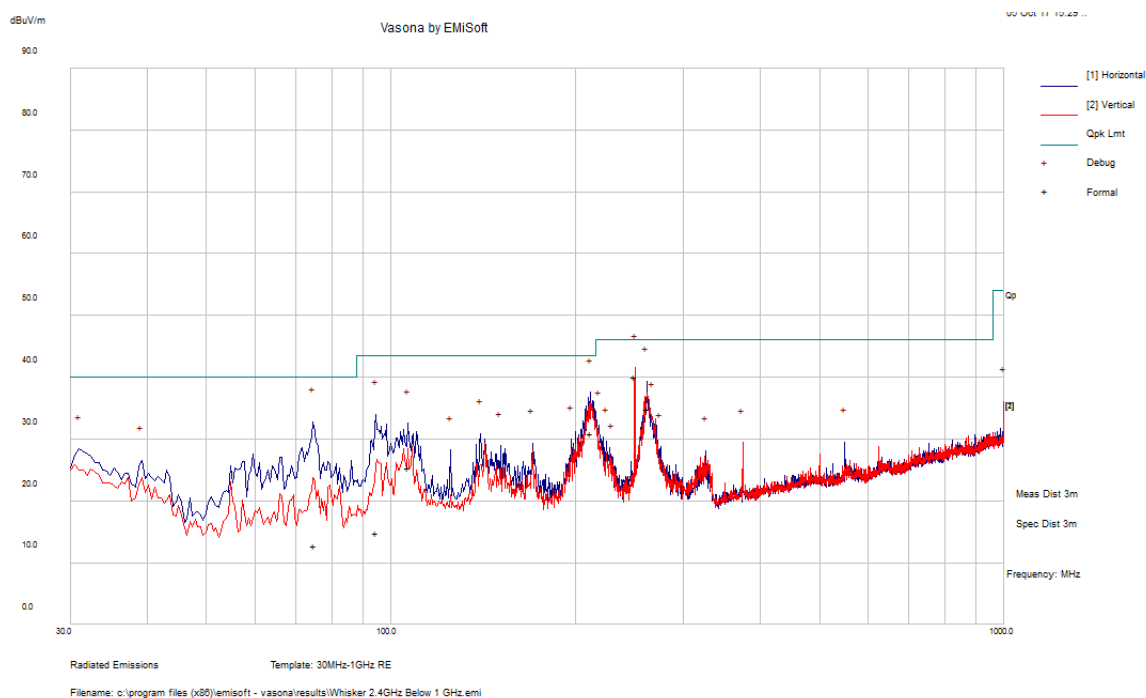
Mode: Transmitting			
Margin (dB)	Frequency (MHz)	Polarization (Horizontal/Vertical)	channel
-4.75	2390	Horizontal	Low channel

Please refer to the following table and plots for specific test result details

5.8 Radiated Emissions Test Results

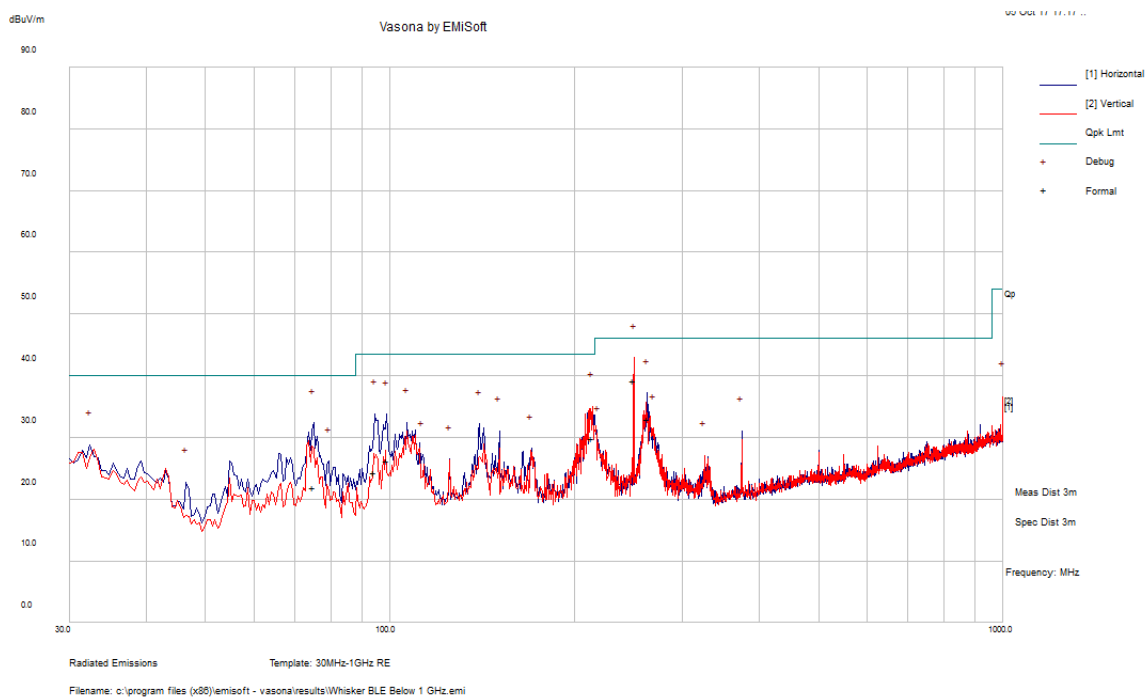
1) 30 MHz – 1 GHz Worst Case, Measured at 3 meters

2.4 GHz Wi-Fi



Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)	Comment
249.9753	40.09	113	V	216	46	-5.91	QP
211.4035	30.87	177	H	132	43.5	-12.63	QP
261.5205	34.98	108	H	217	46	-11.02	QP
74.84825	12.78	131	H	265	40	-27.22	QP
94.436	14.91	179	H	255	43.5	-28.59	QP
106.6848	25.43	267	H	238	43.5	-18.07	QP

Note: Only 6 emissions were present because the other emissions were 20 dB below the limit.

BLE

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBμV/m)	Margin (dB)	Comment
250.0035	-11.93	122	V	56	46	-6.82	QP
74.92375	-16.03	279	H	127	40	-18.08	QP
213.837	-13.16	139	H	285	43.5	-13.65	QP
262.8455	-10.73	109	H	204	46	-13.03	QP
94.3575	-15.27	181	H	60	43.5	-19.23	QP
98.9805	-14.64	205	H	284	43.5	-17.19	QP

Note: Only 6 emissions were present because the other emissions were 20 dB below the noise floor.

2) 1–25 GHz Measured at 3 meters

802.11b mode

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	67.66	14	300	H	28.93	6.29	0	102.88	-	-	PK
2412	65.30	14	300	H	28.93	6.29	0	100.52	-	-	AV
2412	68.07	300	100	V	28.93	6.29	0	103.29	-	-	PK
2412	65.68	300	100	V	28.93	6.29	0	100.90	-	-	AV
2390	28.48	0	200	H	28.93	6.29	0	63.70	74.00	-10.30	PK
2390	16.56	0	200	H	28.93	6.29	0	51.78	54.00	-2.22	AV
2390	28.09	275	100	V	28.93	6.29	0	63.31	74.00	-10.69	PK
2390	16.59	275	100	V	28.93	6.29	0	51.81	54.00	-2.19	AV
4824	46.25	0	100	H	32.56	9.35	36.361	51.80	74.00	-22.20	PK
4824	34.44	0	100	H	32.56	9.35	36.361	39.99	54.00	-14.01	AV
4824	46.53	0	100	V	32.56	9.35	36.361	52.08	74.00	-21.92	PK
4824	35.68	0	100	V	32.56	9.35	36.361	41.23	54.00	-12.77	AV
7236	45.30	0	100	H	36.88	11.54	36.38	57.35	74.00	-16.65	PK
7236	32.92	0	100	H	36.88	11.54	36.38	44.97	54.00	-9.03	AV
7236	45.15	0	100	V	36.88	11.54	36.38	57.20	74.00	-16.80	PK
7236	32.91	0	100	V	36.88	11.54	36.38	44.96	54.00	-9.04	AV
Middle Channel 2437 MHz											
2437	67.23	0	240	H	29.19	6.29	0.00	102.71	-	-	PK
2437	64.67	0	240	H	29.19	6.29	0.00	100.15	-	-	AV
2437	68.91	295	100	V	29.19	6.29	0.00	104.39	-	-	PK
2437	66.25	295	100	V	29.19	6.29	0.00	101.73	-	-	AV
4874	45.45	170	250	H	32.53	9.27	36.33	50.92	74.00	-23.08	PK
4874	34.17	170	250	H	32.53	9.27	36.33	39.64	54.00	-14.36	AV
4874	46.48	0	100	V	32.53	9.27	36.33	51.95	74.00	-22.05	PK
4874	36.01	0	100	V	32.53	9.27	36.33	41.48	54.00	-12.52	AV
7311	45.51	0	100	V	36.99	11.68	36.40	57.78	74.00	-16.22	PK
7311	33.18	0	100	V	36.99	11.68	36.40	45.45	54.00	-8.55	AV

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
High Channel 2462 MHz											
2462	68.82	0	240	H	29.19	6.35	0.00	104.35	-	-	PK
2462	66.21	0	240	H	29.19	6.35	0.00	101.74	-	-	AV
2462	69.74	295	120	V	29.19	6.35	0.00	105.27	-	-	PK
2462	67.16	295	120	V	29.19	6.35	0.00	102.69	-	-	AV
2483.5	27.99	0	100	H	29.18	6.35	0.00	63.52	74.00	-10.48	PK
2483.5	16.39	0	100	H	29.18	6.35	0.00	51.92	54.00	-2.08	AV
2483.5	28.66	0	100	V	29.18	6.35	0.00	64.19	74.00	-9.81	PK
2483.5	16.04	0	100	V	29.18	6.35	0.00	51.57	54.00	-2.43	AV
4924	46.22	0	100	H	32.70	9.27	36.33	51.86	74.00	-22.14	PK
4924	34.37	0	100	H	32.70	9.27	36.33	40.01	54.00	-13.99	AV
4924	46.15	0	100	V	32.70	9.27	36.33	51.79	74.00	-22.21	PK
4924	35.47	0	100	V	32.70	9.27	36.33	41.11	54.00	-12.89	AV
7386	45.48	0	100	V	37.10	11.72	36.41	57.89	74.00	-16.11	PK
7386	33.21	0	100	V	37.10	11.72	36.41	45.62	54.00	-8.38	AV

802.11g mode

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)						
Low Channel 2412 MHz											
2412	72.04	12	300	H	28.93	6.29	0	107.26	-	-	PK
2412	64.50	12	300	H	28.93	6.29	0	99.72	-	-	AV
2412	71.71	300	150	V	28.93	6.29	0	106.93	-	-	PK
2412	63.29	300	150	V	28.93	6.29	0	98.51	-	-	AV
2390	34.19	15	170	H	28.93	6.29	0	69.41	74.00	-4.59	PK
2390	17.03	15	170	H	28.93	6.29	0	52.25	54.00	-1.75	AV
2390	35.61	300	100	V	28.93	6.29	0	70.83	74.00	-3.17	PK
2390	17.55	300	100	V	28.93	6.29	0	52.77	54.00	-1.23	AV
4824	45.92	0	100	H	32.56	9.35	36.361	51.47	74.00	-22.53	PK
4824	33.41	0	100	H	32.56	9.35	36.361	38.96	54.00	-15.04	AV
4824	46.07	0	100	V	32.56	9.35	36.361	51.62	74.00	-22.38	PK
4824	33.60	0	100	V	32.56	9.35	36.361	39.15	54.00	-14.85	AV
Middle Channel 2437 MHz											
2437	71.23	7	100	H	29.19	6.29	0.00	106.71	-	-	PK
2437	63.59	7	100	H	29.19	6.29	0.00	99.07	-	-	AV
2437	72.31	280	140	V	29.19	6.29	0.00	107.79	-	-	PK
2437	65.39	280	140	V	29.19	6.29	0.00	100.87	-	-	AV
4874	45.14	0	100	H	32.53	9.27	36.33	50.61	74.00	-23.39	PK
4874	33.03	0	100	H	32.53	9.27	36.33	38.50	54.00	-15.50	AV
4874	45.51	0	100	V	32.53	9.27	36.33	50.98	74.00	-23.02	PK
4874	33.27	0	100	V	32.53	9.27	36.33	38.74	54.00	-15.26	AV
High Channel 2472 MHz											
2462	72.91	6	100	H	29.19	6.35	0.00	108.44	-	-	PK
2462	64.74	6	100	H	29.19	6.35	0.00	100.27	-	-	AV
2462	73.81	290	115	V	29.19	6.35	0.00	109.34	-	-	PK
2462	66.07	290	115	V	29.19	6.35	0.00	101.60	-	-	AV
2483.5	28.67	0	130	H	29.18	6.35	0.00	64.20	74.00	-9.80	PK
2483.5	16.39	0	130	H	29.18	6.35	0.00	51.92	54.00	-2.08	AV
2483.5	28.81	280	100	V	29.18	6.35	0.00	64.34	74.00	-9.66	PK
2483.5	16.96	280	100	V	29.18	6.35	0.00	52.49	54.00	-1.51	AV
4924	47.09	0	100	H	32.70	9.27	36.33	52.73	74.00	-21.27	PK
4924	34.36	0	100	H	32.70	9.27	36.33	40.00	54.00	-14.00	AV
4924	47.01	0	100	V	32.70	9.27	36.33	52.65	74.00	-21.35	PK
4924	34.72	0	100	V	32.70	9.27	36.33	40.36	54.00	-13.64	AV

802.11n20 mode

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2412 MHz											
2412	69.75	10	300	H	28.93	6.29	0	104.97	-	-	PK
2412	62.35	10	300	H	28.93	6.29	0	97.57	-	-	AV
2412	70.10	305	100	V	28.93	6.29	0	105.32	-	-	PK
2412	62.30	305	100	V	28.93	6.29	0	97.52	-	-	AV
2390	29.35	0	100	H	28.93	6.29	0	64.57	74.00	-9.43	PK
2390	16.50	0	100	H	28.93	6.29	0	51.72	54.00	-2.28	AV
2390	30.13	285	100	V	28.93	6.29	0	65.35	74.00	-8.65	PK
2390	17.45	285	100	V	28.93	6.29	0	52.67	54.00	-1.33	AV
4824	46.45	0	100	H	32.56	9.35	36.361	52.00	74.00	-22.00	PK
4824	34.00	0	100	H	32.56	9.35	36.361	39.55	54.00	-14.45	AV
4824	45.86	0	100	V	32.56	9.35	36.361	51.41	74.00	-22.59	PK
4824	33.46	0	100	V	32.56	9.35	36.361	39.01	54.00	-14.99	AV
Middle Channel 2437 MHz											
2437	69.62	10	250	H	29.19	6.29	0.00	105.10	-	-	PK
2437	61.41	10	250	H	29.19	6.29	0.00	96.89	-	-	AV
2437	70.02	275	130	V	29.19	6.29	0.00	105.50	-	-	PK
2437	62.78	275	130	V	29.19	6.29	0.00	98.26	-	-	AV
4874	45.91	0	100	H	32.53	9.27	36.33	51.38	74.00	-22.62	PK
4874	32.85	0	100	H	32.53	9.27	36.33	38.32	54.00	-15.68	AV
4874	46.01	0	100	V	32.53	9.27	36.33	51.48	74.00	-22.52	PK
4874	32.98	0	100	V	32.53	9.27	36.33	38.45	54.00	-15.55	AV
High Channel 2462 MHz											
2462	70.42	7	100	H	29.19	6.35	0.00	105.95	-	-	PK
2462	62.75	7	100	H	29.19	6.35	0.00	98.28	-	-	AV
2462	71.27	275	135	V	29.19	6.35	0.00	106.80	-	-	PK
2462	63.67	275	135	V	29.19	6.35	0.00	99.20	-	-	AV
2483.5	27.86	0	100	H	29.18	6.35	0.00	63.39	74.00	-10.61	PK
2483.5	16.18	0	100	H	29.18	6.35	0.00	51.71	54.00	-2.29	AV
2483.5	28.16	0	100	V	29.18	6.35	0.00	63.69	74.00	-10.31	PK
2483.5	16.18	0	100	V	29.18	6.35	0.00	51.71	54.00	-2.29	AV
4924	46.66	0	100	H	32.70	9.27	36.33	52.30	74.00	-21.70	PK
4924	34.28	0	100	H	32.70	9.27	36.33	39.92	54.00	-14.08	AV
4924	46.69	0	100	V	32.70	9.27	36.33	52.33	74.00	-21.67	PK
4924	34.45	0	100	V	32.70	9.27	36.33	40.09	54.00	-13.91	AV

BLE

Frequency (MHz)	S.A. Reading (dBμV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre- Amp. (dB)	Cord. Reading (dBμV/m)	FCC/ISED		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBμV/m)	Margin (dB)	
Low Channel 2402 MHz											
2402	70.06	333	175	H	28.32	3.43	0	101.81	-	-	PK
2402	69.80	333	175	H	28.32	3.43	0	101.55	-	-	AV
2402	63.84	229	100	V	28.32	3.43	0	95.59	-	-	PK
2402	62.30	229	100	V	28.32	3.43	0	94.05	-	-	AV
2390	57.10	333	175	H	28.32	3.83	36.588	52.66	74.00	-21.34	PK
2390	53.69	333	175	H	28.32	3.83	36.588	49.25	54.00	-4.75	AV
2390	51.69	229	100	V	28.32	3.83	36.588	47.25	74.00	-26.75	PK
2390	47.83	229	100	V	28.32	3.83	36.588	43.39	54.00	-10.61	AV
4804	46.07	0	100	H	32.87	5.93	36.361	48.50	74.00	-25.50	PK
4804	34.69	0	100	H	32.87	5.93	36.361	37.12	54.00	-16.88	AV
7206	45.18	0	100	H	35.87	7.86	36.38	52.52	74.00	-21.48	PK
7206	33.22	0	100	H	35.87	7.86	36.38	40.56	54.00	-13.44	AV
9608	44.37	0	100	H	37.98	11.66	36.433	57.58	74.00	-16.42	PK
9608	33.85	0	100	H	37.98	11.66	36.433	47.06	54.00	-6.94	AV
Middle Channel 2440 MHz											
2440	69.58	331	140	H	28.32	3.43	0.00	101.33	-	-	PK
2440	68.39	331	140	H	28.32	3.43	0.00	100.14	-	-	AV
2440	64.04	221	100	V	28.32	3.43	0.00	95.79	-	-	PK
2440	62.76	221	100	V	28.32	3.43	0.00	94.51	-	-	AV
4880	44.77	0	100	H	33.13	6.01	36.33	47.58	74.00	-26.42	PK
4880	34.00	0	100	H	33.13	6.01	36.33	36.81	54.00	-17.19	AV
7320	45.21	0	100	H	36.39	7.94	36.40	53.14	74.00	-20.86	PK
7320	33.82	0	100	H	36.39	7.94	36.40	41.75	54.00	-12.25	AV
High Channel 2480 MHz											
2480	70.77	330	139	H	28.37	3.43	0.00	102.57	-	-	PK
2480	69.59	330	139	H	28.37	3.43	0.00	101.39	-	-	AV
2480	64.58	228	100	V	28.37	3.43	0.00	96.38	-	-	PK
2480	63.16	228	100	V	28.37	3.43	0.00	94.96	-	-	AV
2483.5	52.00	330	139	H	28.37	3.88	36.59	47.66	74.00	-26.34	PK
2483.5	52.15	330	139	H	28.37	3.88	36.59	47.81	54.00	-6.19	AV
4960	45.11	0	100	H	33.24	6.18	36.28	48.25	74.00	-25.75	PK
4960	33.80	0	100	H	33.24	6.18	36.28	36.94	54.00	-17.06	AV
7440	43.48	0	100	H	36.54	7.98	36.41	51.59	74.00	-22.41	PK
7440	33.09	0	100	H	36.54	7.98	36.41	41.20	54.00	-12.80	AV

6 Appendix

Please see attachments:

Annex A – EUT Test Setup Photos

Annex B – EUT photos

--- END OF REPORT ---