FCC PART 15, SUBPART C
ISEDC RSS-247, ISSUE 2, FEBRUARY 2017
TEST REPORT

For

Zebra Technologies Corporation

3 Overlook Point, Lincolnshire, IL 60069, USA

FCC ID: I28MD-FXLAN11AC
IC: 3798B-FXLAN11AC

Report Type: Class II Permissive Change	**Product Type:** Wireless 802.11ac + Bluetooth Module
Prepared By:	Allen Huang Test Technician
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Reviewed By:	Christian McCaig RF Engineer
Bay Area Compliance Laboratories Corp. 1274 Anvilwood Avenue, Sunnyvale, CA 94089, USA Tel: (408) 732-9162 Fax: (408) 732-9164	

* This test report may contain data and test methods that are not covered by BACL's scope of accreditation as of the test report date shown above. These items are marked within the test report text with an asterisk "*"

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2009141-DSS	Original Report	2021-02-17

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report was prepared on behalf of *Zebra Technologies Corp.*, and their product model: WYSBHVGXG, FCC ID: I28MD-FXLAN11AC, IC: 3798B-FXLAN11AC, the "EUT" as referred to in this report. The EUT is a Wireless 802.11ac + Bluetooth Module. The EUT was installed in host device model number: ZP620, ZD621, ZP420, ZD421, ZP506. The host devices were declared to be identical, and ZD621 was selected for testing. Please refer to the manufacturer declaration of similarity letter in Annex C of this report.

1.2 Objective

This report was prepared on behalf of *Zebra Technologies Corp.* in accordance with Part 2, Subpart J, and Part 15, Subparts B and C of the Federal Communication Commission's rules and ISEDC RSS-247 Issue 2, February 2017.

The objective is to determine compliance with FCC Part 15.247 and ISEDC RSS-247 rules for Radiated Spurious Emissions testing, AC Line Conducted Emission testing for multiple transmitters co-location configuration.

This project is a Permissive Change II submission for the purpose of placing the module in new host (Model: ZP620, ZD621, ZP420, ZD421, ZP506), and enabling colocation with RFID (FCC ID: UZ7RE40, IC: 109AN-RE40).

Model Number	WYSBHVGXG (EUT)
FCC ID	I28MD-FXLAN11AC
IC	3798B-FXLAN11AC
Radio Type	WLAN-ac/bt
Operating Frequency	2402MHz – 2480MHz, 2412MHz – 2462MHz 5180MHz – 5240MHz, 5260MHz – 5320MHz 5500MHz – 5700MHz, 5745MHz – 5825MHz
Modulation	GFSK, π/4-DQPSK, 8DPSK (BDR/EDR); GFSK (LE); DSSS, OFDM (WLAN)
Channel Spacing	1MHz (BDR, EDR); 2MHz (LE) 5MHz (2.4G); 20MHz (5G); 40MHz (5G) ; 80MHz (5G)
Omnidirectional Antenna Gain	0.3 dBi (2.4G), 4.4 dBi (5G)
Original RF Output Power	0.011W (BDR/EDR); 0.007W (LE) 0.048W (2.4G WLAN); 0.020W (UNII-1); 0.016W (UNII-2); 0.025W (UNII-2E); 0.015W (UNII-3)

Model Number	RE40
FCC ID	UZ7RE40
IC	109AN-RE40
Radio Type	UHF RFID
Operating Frequency	902.75MHz – 927.25MHz
Modulation	ASK
Channel Spacing	500 kHz
Loop Antenna Gain	-30 dBi
RF Output power	0.5272 Watt

1.3 Related Submittal(s)/Grant(s)

FCC Part 15, Subpart C, Equipment Class: DTS with FCC ID: I28MD-FXLAN11AC, IC: 3798B-FXLAN11AC
FCC Part 15, Subpart E, Equipment Class: NII with FCC ID: I28MD-FXLAN11AC, IC: 3798B-FXLAN11AC

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 v05r02: 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 ^{o} 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 3297.02),*** 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 Accreditation Certificate Number 3297.03)*** to certify

- 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 3297.01)*** 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: (Innovation, Science and Economic development Canada - ISED) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - 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 Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
  - 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 v05r02.

The EUT was tested in a testing mode to represent worst-case results during the final qualification test.

The worst-case configuration was selected based on the original test report, and verified consistent by measuring the conducted output power.

Radio	Frequency	Power Setting
BT (BDR)	2402	C
RFID	902.75	Default

2.2 EUT Exercise Software

The test utility used was the "Toolbox v1.83", provided by *Zebra Technologies Corp.*, the software is compliant with the standard requirements being tested against.

2.3 Equipment Modification

None.

2.4 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

2.5 Remote Support Equipment

None.

2.6 Interface Ports and Cabling

Cable Descriptions	Length (m)	From	To
USB Cable	< 1	Laptop	EUT

3 Summary of Test Results

Results reported relate only to the product tested.

FCC & ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirements	Compliant
FCC §2.1091, §15.247(i) ISED RSS-102	RF Exposure	Compliant
FCC §15.207 ISEDC RSS-Gen §8.8	AC Line Conducted Emissions	Compliant
FCC §2.1053, §15.35(b), §15.205, §15.209, §15.247(d) ISEDC RSS-247 §5.5 ISEDC RSS-Gen §8.9, §8.10	Radiated Spurious Emissions	Compliant

4 FCC §15.203 & ISEDC RSS-Gen §6.8 - 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 §6.8: Transmitter Antenna

The applicant for equipment certification shall provide a list of all antenna types that may be used with the transmitter, where applicable (i.e. for transmitters with detachable antenna), indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna. The test report shall demonstrate the compliance of the transmitter with the limit for maximum equivalent isotropically radiated power (e.i.r.p.) specified in the applicable RSS, when the transmitter is equipped with any antenna type, selected from this list.

For expediting the testing, measurements may be performed using only the antenna with highest gain of each combination of transmitter and antenna type, with the transmitter output power set at the maximum level. However, the transmitter shall comply with the applicable requirements under all operational conditions and when in combination with any type of antenna from the list provided in the test report (and in the notice to be included in the user manual, provided below).

When measurements at the antenna port are used to determine the RF output power, the effective gain of the device's antenna shall be stated, based on a measurement or on data from the antenna's manufacturer.

The test report shall state the RF power, output power setting and spurious emission measurements with each antenna type that is used with the transmitter being tested.

For license-exempt equipment with detachable antennas, the user manual shall also contain the following notice in a conspicuous location:

This radio transmitter has been approved by Innovation, Science and Economic Development Canada to operate with the antenna types listed below, with the maximum permissible gain indicated. Antenna types not included in this list that have a gain greater than the maximum gain indicated for any type listed are strictly prohibited for use with this device.

Immediately following the above notice, the manufacturer shall provide a list of all antenna types which can be used with the transmitter, indicating the maximum permissible antenna gain (in dBi) and the required impedance for each antenna type.

4.2 Antenna Description

External/Internal/ Integral	Part Number	Antenna Type	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Internal	P1110774-01	Patch Antenna	2400-2480 MHz	0.3
			5150-5850 MHz	4.4

5 FCC §15.247(i) §2.1091 & ISED RSS-102 - RF Exposure

5.1 Applicable Standards

According to FCC §2.1091 (Mobile Devices) RF exposure is calculated.

Limits for General Population/Uncontrolled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minute)
Limits for General Population/Uncontrolled Exposure				
0.3-1.34	614	1.63	*(100)	30
1.34-30	824/f	2.19/f	*($180/f^2$)	30
30-300	27.5	0.073	0.2	30
300-1500	/	/	f/1500	30
1500-100,000	/	/	1.0	30

Note: f = frequency in MHz
* = Plane-wave equivalent power density

According to ISED RSS-102 Issue 5:

2.5.2 Exemption Limits for Routine Evaluation – RF Exposure Evaluation

RF exposure evaluation is required if the separation distance between the user and/or bystander and the device's radiating element is greater than 20 cm, except when the device operates as follows:

- below 20 MHz[6] and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 1 W (adjusted for tune-up tolerance);
- at or above 20 MHz and below 48 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $4.49/f^{0.5}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 48 MHz and below 300 MHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 0.6 W (adjusted for tune-up tolerance);
- at or above 300 MHz and below 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than $1.31 \times 10^{-2} f^{0.6834}$ W (adjusted for tune-up tolerance), where f is in MHz;
- at or above 6 GHz and the source-based, time-averaged maximum e.i.r.p. of the device is equal to or less than 5 W (adjusted for tune-up tolerance).

In these cases, the information contained in the RF exposure technical brief may be limited to information that demonstrates how the e.i.r.p. was derived.

5.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

5.3 MPE Results

BT 2.4 GHz Radio (FCC ID: I28MD-FXLAN11AC)

Maximum average output power at antenna input terminal (dBm):	10.27
Maximum average output power at antenna input terminal (mW):	10.641
Prediction distance (cm):	20
Prediction frequency (MHz):	2402
Maximum Antenna Gain, typical (dBi):	0.3
Maximum Antenna Gain (numeric):	1.0715
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0023
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

WLAN 2.4 GHz Radio (FCC ID: I28MD-FXLAN11AC)

Maximum average output power at antenna input terminal (dBm):	16.77
Maximum average output power at antenna input terminal (mW):	47.534
Prediction distance (cm):	20
Prediction frequency (MHz):	2412
Maximum Antenna Gain, typical (dBi):	0.3
Maximum Antenna Gain (numeric):	1.0715
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.010
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

WLAN 5 GHz Radio (FCC ID: I28MD-FXLAN11AC)

Maximum average output power at antenna input terminal (dBm):	14.76
Maximum average output power at antenna input terminal (mW):	29.923
Prediction distance (cm):	20
Prediction frequency (MHz):	5550
Maximum Antenna Gain, typical (dBi):	4.4
Maximum Antenna Gain (numeric):	2.75
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.016
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

RFID 900 MHz Radio (FCC ID: UZ7RE40)

Maximum average output power at antenna input terminal (dBm):	27.20
Maximum average output power at antenna input terminal (mW):	524.807
Prediction distance (cm):	20
Prediction frequency (MHz):	902.75
Maximum Antenna Gain, typical (dBi):	-30
Maximum Antenna Gain (numeric):	0.001
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0001
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.602

Radio Co-location

Frequency Band	Max Conducted Power (dBm)	Antenna Gain (dBi)	Evaluated Distance (cm)	Worst-Case MPE (mW/cm^2)	MPE Limit (mW/cm^2)	Worst-Case MPE Ratios	Sum of MPE Ratios	Limit
Worst Case								
900 MHz Radio	27.20	-30	20	0.0001	0.602	0.02%	1.62%	100%
WLAN/BT Radio	14.76	4.4	20	0.016	1.0	1.6%		

Results

For the different combination of transmitters, a separation distance of 20 cm complies with the MPE simultaneous transmission limit of ≤ 1.0.

5.4 RF exposure evaluation exemption for IC

RFID 902.75 MHz (IC: 109AN-RE40)

27.20 dBm + (-30.0) dBi = -2.8 dBm < $1.31\times10^{-2}f^{0.6834}$ = 1.371 W = 31.370 dBm

BT BR, 2402 MHz (IC: 3798B-FXLANAC)

10.27 dBm + 0.3 dBi = 10.57 dBm < $1.31\times10^{-2}f^{0.6834}$ = 2.676 W = 34.275 dBm

WLAN 802.11b, 2412 MHz (IC: 3798B-FXLANAC)

16.77 dBm + 0.3 dBi = 17.07 dBm < $1.31\times10^{-2}f^{0.6834}$ = 2.684 W = 34.288 dBm

WLAN 802.11n40, 5550 MHz (IC: 3798B-FXLANAC)

14.76 dBm + 4.4 dBi = 19.16 dBm < $1.31\times10^{-2}f^{0.6834}$ = 4.744 W = 36.761 dBm

Therefore, RF exposure is not required.

6 FCC §15.207 & ISEDC RSS-Gen §8.8 - AC Line Conducted Emissions

6.1 Applicable Standards

As per FCC §15.207 and ISED RSS-Gen §8.8 Conducted limits:

For an intentional radiator that is designed to be connected to the public utility (AC) power line, the radio frequency voltage that is conducted back onto the AC power line on any frequency or frequencies within the band 150 kHz to 30 MHz shall not exceed the limits in the following table, as measured using a 50 μH/50 ohms line impedance stabilization network (LISN). Compliance with the provisions of this paragraph shall be based on the measurement of the radio frequency voltage between each power line and ground at the power terminal. The lower limit applies at the boundary between the frequencies ranges.

Frequency of Emission (MHz)	Conducted Limit (dBuV)	
	Quasi-Peak	Average
0.15-0.5	66 to 56 Note1	56 to 46 Note2
0.5-5	56	46
5-30	60	50

Note1: Decreases with the logarithm of the frequency.
Note2: A linear average detector is required

6.2 Test Setup

The measurement was performed at shield room, using the setup per ANSI C63.10-2013 measurement procedure. The specification used were FCC §15.207 and ISED RSS-Gen §8.8 limits.

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

The AC/DC power adapter of the EUT was connected with LISN-1 which provided 120 V / 60 Hz AC power.

6.3 Test Procedure

During the conducted emissions test, the power cord of the EUT host system was connected to the mains outlet of the LISN-1 and the power cords of support equipment were connected to LISN-2.

Maximizing procedure was performed on the six (6) highest emissions of the EUT.

All data were recorded in the peak, quasi-peak, and average detection mode. Quasi-Peak readings are distinguished with a “QP.” Average readings are distinguished with an “Ave”.

6.4 Corrected Amplitude & Margin Calculation

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

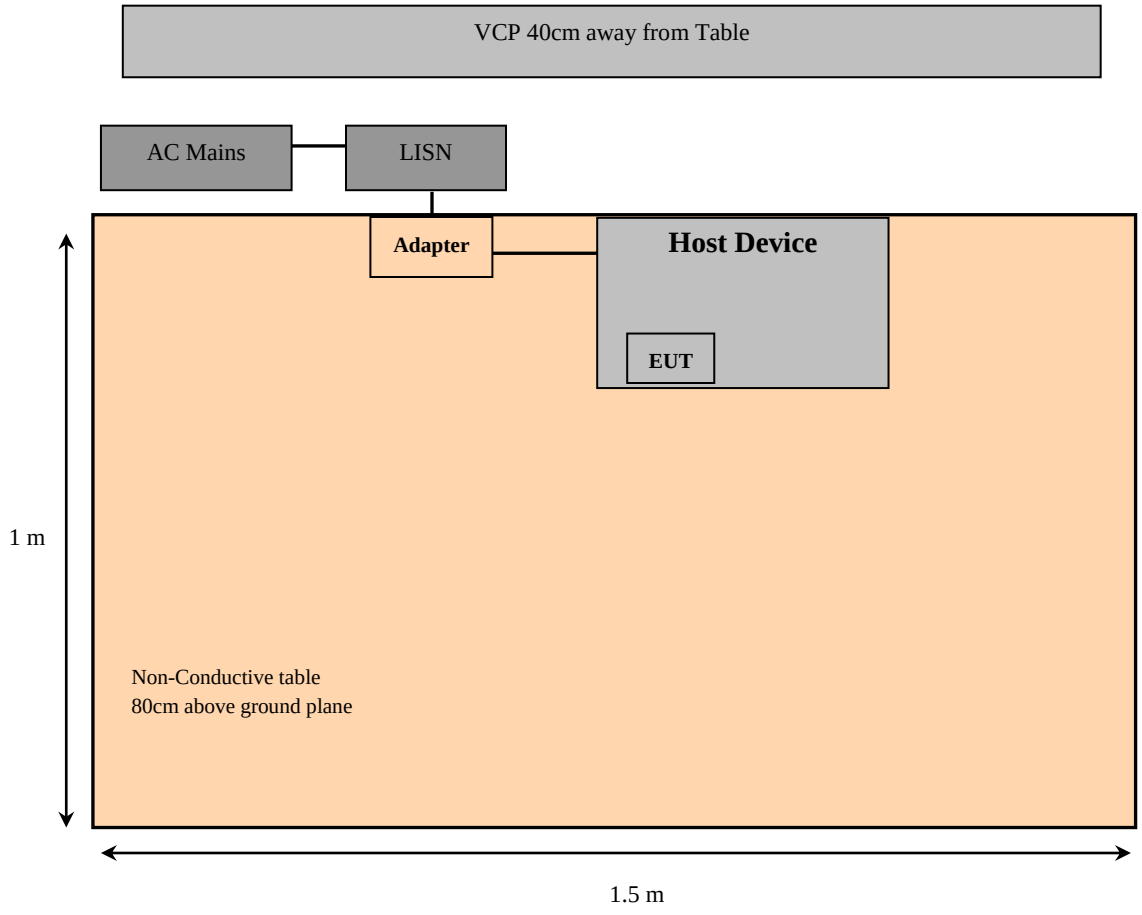
CA = Ai + CL + Atten

For example, a corrected amplitude of 46.2 dBuV = Indicated Reading (32.5 dBuV) + Cable Loss (3.7 dB) + Attenuator (10 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:

Margin = Corrected Amplitude – Limit

6.5 Test Setup Block Diagram



6.6 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde and Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2018-10-26	2.5 years
Rohde and Schwarz	Impulse Limiter	ESH3-Z2	101962	2020-11-12	1 year
Solar Electronics Company	High Pass Filter	Type 7930-100	7930150204	2020-11-12	1 year
Suirong	30 ft conductive emission cable	LMR 400	-	N/R	N/A
FCC	LISN	FCC-LISN-50-25-2-10-CISPR16	160131	2019-06-17	18 months
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

6.7 Test Environmental Conditions

Temperature:	23º C
Relative Humidity:	42 %
ATM Pressure:	101.31 kPa

The testing was performed by Allen Huang on 2020-11-16 in 5m chamber 3

6.8 Summary of Test Results

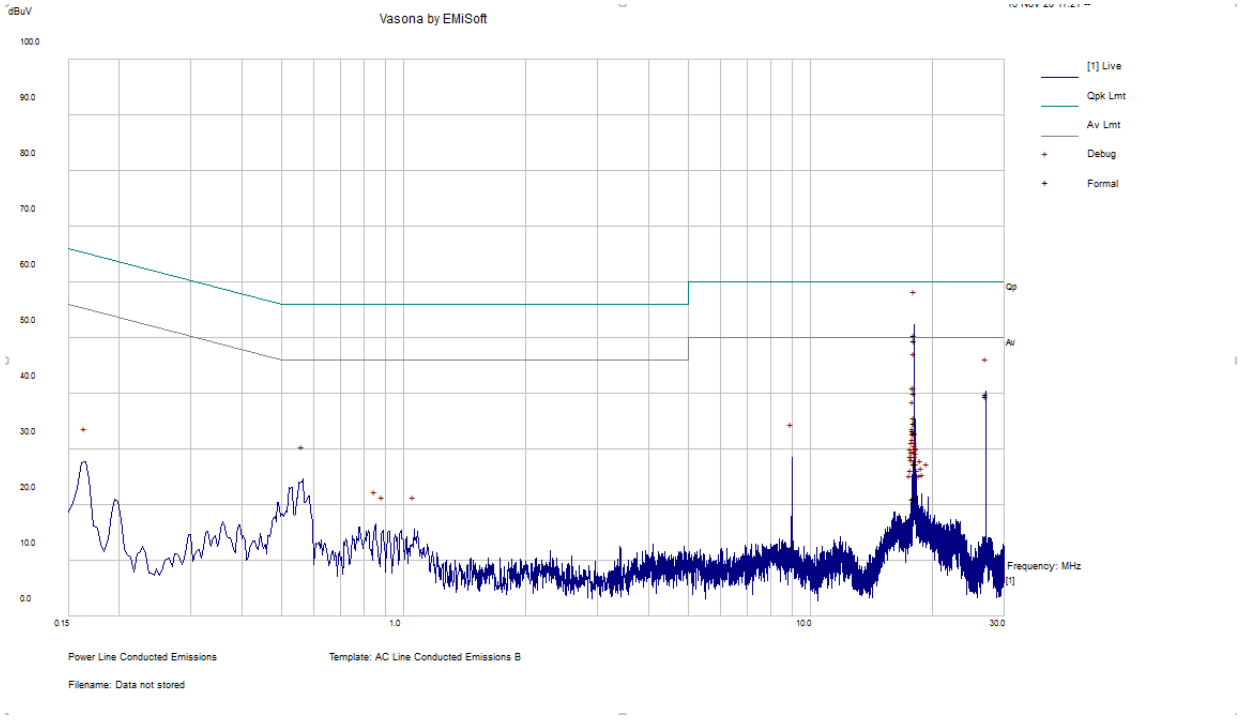
According to the recorded data in following table, the EUT complied with the FCC 15C and ISEDC RSS-Gen standard's conducted emissions limits, with the margin reading of:

Connection: AC/DC Adapter Connected to 120 V/60 Hz, AC			
Margin (dB)	**Frequency (MHz)**	**Conductor Mode (Live/Neutral)**	**Range (MHz)**
-9.58	17.99909	Live	0.15-30

6.9 Conducted Emissions Test Plots and Data

BT+RFID Colocation

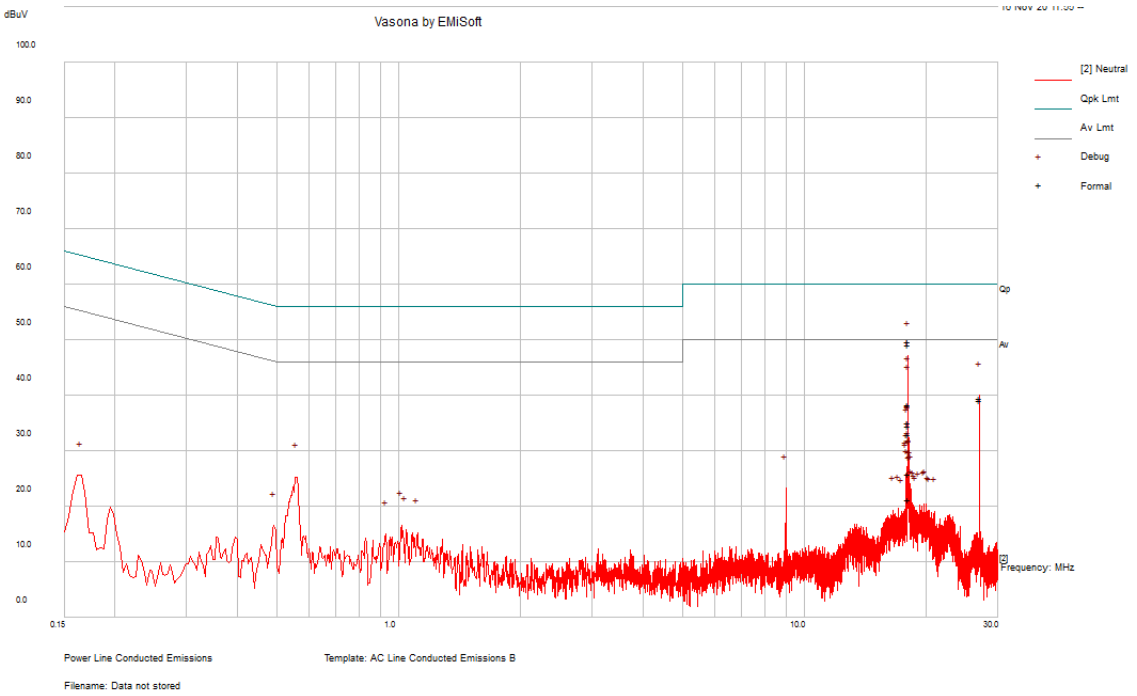
120 V, 60 Hz – Live



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.99909	50.42	Live	60	-9.58	QP
18.00144	49.57	Live	60	-10.43	QP
26.99902	39.56	Live	60	-20.44	QP
18.0524	33.03	Live	60	-26.97	QP
17.94511	33.42	Live	60	-26.58	QP
17.98118	40.04	Live	60	-19.96	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.99909	35.72	Live	50	-14.28	Ave.
18.00144	34.81	Live	50	-15.19	Ave.
26.99902	39.89	Live	50	-10.11	Ave.
18.0524	21.38	Live	50	-28.62	Ave.
17.94511	21.17	Live	50	-28.83	Ave.
17.98118	27.47	Live	50	-22.53	Ave.

120 V, 60 Hz – Neutral



Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.99924	49.83	Neutral	60	-10.17	QP
18.00115	49.23	Neutral	60	-10.77	QP
26.99952	39.14	Neutral	60	-20.86	QP
17.99979	49.8	Neutral	60	-10.2	QP
18.05465	33	Neutral	60	-27	QP
18.01981	38.41	Neutral	60	-21.59	QP

Frequency (MHz)	Corrected Amplitude (dBuV)	Conductor (Live/Neutral)	Limit (dBuV)	Margin (dB)	Detector (QP/Ave.)
17.99924	35.19	Neutral	50	-14.81	Ave.
18.00115	34.55	Neutral	50	-15.45	Ave.
26.99952	39.48	Neutral	50	-10.52	Ave.
17.99979	35.16	Neutral	50	-14.84	Ave.
18.05465	21.28	Neutral	50	-28.72	Ave.
18.01981	25.98	Neutral	50	-24.02	Ave.

7 FCC §15.35(b), §15.205, §15.209, §15.247(d) & ISEDC RSS-247 §5.5, RSS-Gen §8.9, §8.10 - Spurious Radiated Emissions

7.1 Applicable Standards

As per FCC §15.35(b): 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) 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 0.495 – 0.505 2.1735 – 2.1905 4.125 – 4.128 4.17725 – 4.17775 4.20725 – 4.20775 6.215 – 6.218 6.26775 – 6.26825 6.31175 – 6.31225 8.291 – 8.294 8.362 – 8.366 8.37625 – 8.38675 8.41425 – 8.41475 12.29 – 12.293 12.51975 – 12.52025 12.57675 – 12.57725 13.36 – 13.41	16.42 – 16.423 16.69475 – 16.69525 25.5 – 25.67 37.5 – 38.25 73 – 74.6 74.8 – 75.2 108 – 121.94 123 – 138 149.9 – 150.05 156.52475 – 156.52525 156.7 – 156.9 162.0125 –167.17 167.72 – 173.2 240 – 285 322 – 335.4 399.9 – 410 608 – 614	960 – 1240 1300 – 1427 1435 – 1626.5 1645.5 – 1646.5 1660 – 1710 1718.8 – 1722.2 2200 – 2300 2310 – 2390 2483.5 – 2500 2690 – 2900 3260 – 3267 3.332 – 3.339 3 3458 – 3 358 3.600 – 4.400	4. 5 – 5. 15 5. 35 – 5. 46 7.25 – 7.75 8.025 – 8.5 9.0 – 9.2 9.3 – 9.5 10.6 – 12.7 13.25 – 13.4 14.47 – 14.5 15.35 – 16.2 17.7 – 21.4 22.01 – 23.12 23.6 – 24.0 31.2 – 31.8 36.43 – 36.5 Above 38.6

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 (µv/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.

7.2 Test Setup

The radiated emissions tests were performed in the 5-meter chamber and 10-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.

The spacing between the peripherals was 10 centimeters.

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

7.3 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 meters, and the EUT was placed on a turntable, which was 0.8 meters and 1.5 meters 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:

RBW = 100 kHz / VBW = 300 kHz / Sweep = Auto

Above 1000 MHz:

(1) Peak: RBW = 1MHz / VBW = 1MHz / Sweep = Auto
(2) Average: RBW = 1MHz / VBW = 10Hz or 1/T / Sweep = Auto

7.4 Corrected Amplitude and Margin Calculation

For emissions below 1 GHz,

The Corrected Amplitude (CA) is calculated by adding the Correction Factor to the S.A. Reading. The basic equation is as follows:

CA = S.A. Reading + Correction Factor

For example, a corrected amplitude of 40.3 dBuV/m = S.A. Reading (32.5 dBuV) + Correction Factor (7.8 dB/m)

The Correction Factor is calculated by adding the Antenna Factor (AF), the Cable Loss (CL), the Attenuator Factor (Atten) and subtracting the Amplifier Gain (Ga) together. This calculation is done in the measurement software, and reported in the test result section. The basic equation is as follows:

Correction Factor = AF + CL + Atten – Ga

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:

Margin = Corrected Amplitude – Limit

For emission above 1 GHz,

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:

CA = Ai + AF + CL + Atten – 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:

Margin = Corrected Amplitude – Limit

7.5 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100044	2018-10-26	2.5 years
Agilent	Analyzer, Spectrum	E4446A	US44300386	2019-08-24	18 months
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/R
BACL	5m3 Sensitivity Box	1	2	2020-10-27	1 year
HP	Pre-Amplifier	8447D	2944A07030	2020-08-17	1 year
AH Systems	Pre-Amplifier	PAM 1840 VH	170	2020-11-09	1 year
Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2019-11-20	2 years
ETS Lindgren	Horn Antenna	3117	00218973	2019-02-13	2.5 years
Wisewave	Antenna, Horn 18-26.5GHz	ARH-4223-02	10555-02	2020-02-05	2 years
MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35'	LMR400UF	BACL1904161	2020-05-20	1 year
IW Microwave	157 Series Cable Armored with 2.92mm Male Plugs on Both Sides	KPS-1571AN-2400	DC 1922	2020-06-06	1 year
-	RF cable	-	-	Each time[1]	N/A
-	Notch filters	-	-	Each time[1]	N/A
Keysight Technologies	RF Limiter	11867A	MY42243052	2020-10-27	1 year
Vasona	Test software	V6.0 build 11	10400213	N/R	N/R

Note[1]: cable and notch filters 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 the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

7.6 Test Environmental Conditions

Temperature:	20-22 ºC
Relative Humidity:	42-50 %
Barometric Pressure:	102.7 kPa

The testing was performed by Allen Huang on 2020-11-16 in 5m chamber 3.

7.7 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:

Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Mode, channel**
-13.52	449.796	Horizontal	BDR, 2402 MHz + 902.75 MHz RFID

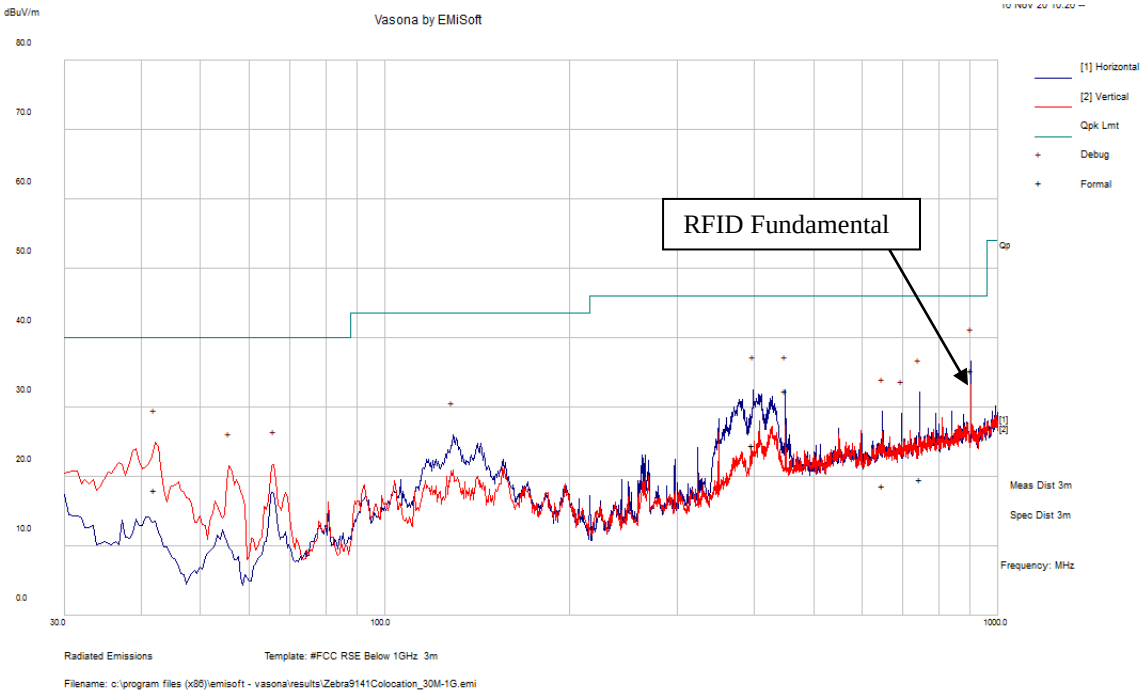
Please refer to the following table and plots for specific test result details.

7.8 Radiated Emissions Test Results

For BT + RFID Colocation

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

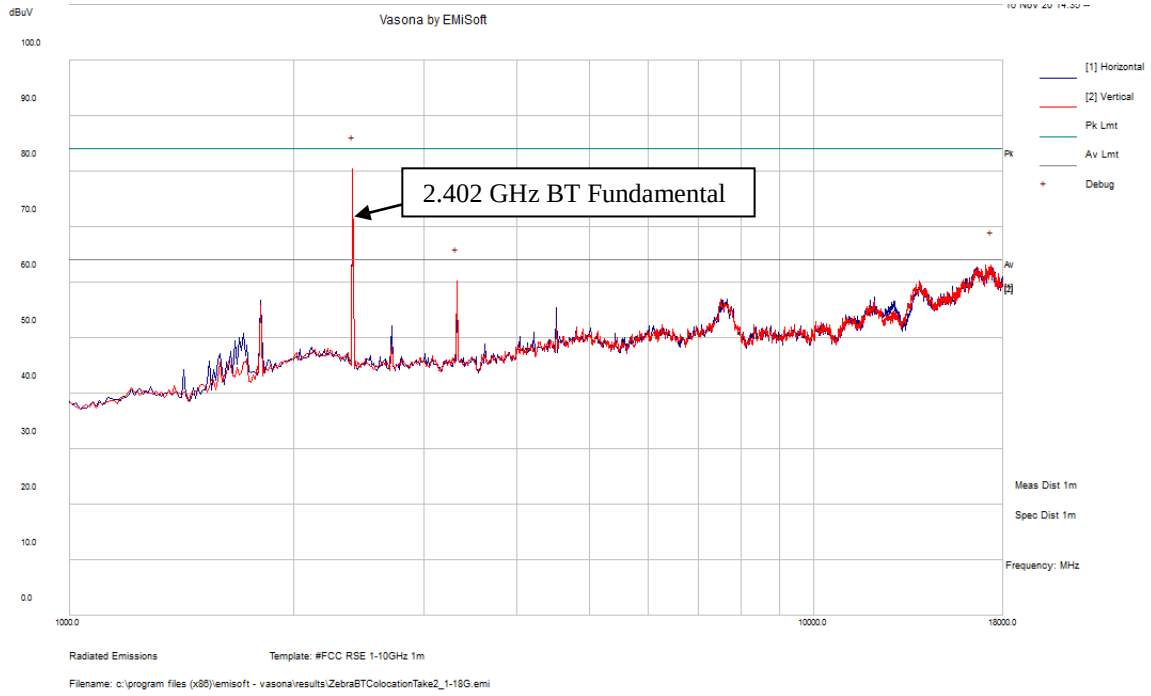
Bluetooth BDR 2.402 GHz + RFID 902.75 MHz Colocation



Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
398.1725	31.9	-7.33	24.57	231	H	247	46	-21.43	QP
449.796	38.75	-6.27	32.48	195	H	293	46	-13.52	QP
744.767	21.83	-2.12	19.7	127	H	222	46	-26.3	QP
42.1395	29.53	-11.48	18.05	110	V	327	40	-21.95	QP
648.1978	22.18	-3.4	18.78	228	V	298	46	-27.22	QP

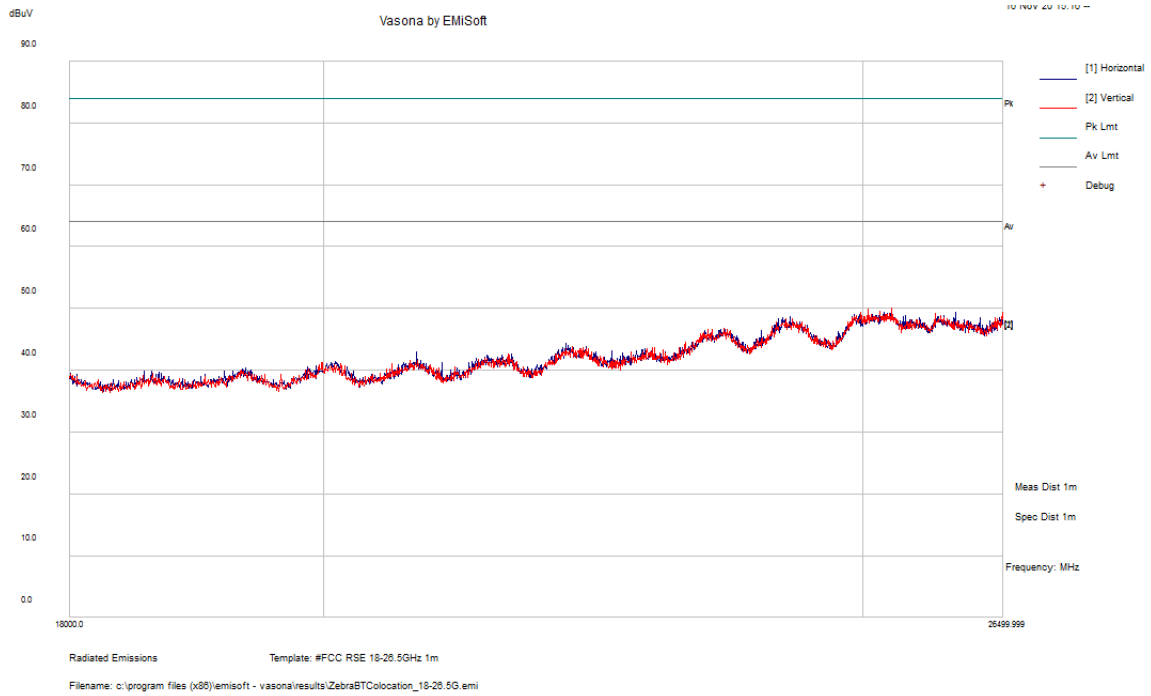
2) 1 – 18 GHz Worst Case, Measured at 1 meter

Bluetooth BDR 2.402 GHz + RFID 902.75 MHz Colocation



3) 18 – 26.5 GHz Worst Case, Measured at 1 meter

Bluetooth BDR 2.402 GHz + RFID 902.75 MHz Colocation



8 Annex A (Normative) - EUT Test Setup Photographs

Please refer to the attachment

9 Annex B (Normative) – Host Device External Photographs

Please refer to the attachment

10 Annex C (Informative) - Manufacturer Declaration of Similarity

ZEBRA

DECLARATION OF SIMILARITY

February 10, 2021

To:
Bay Area Compliance Laboratories Corp.
1274 Anvilwood Ave.
Sunnyvale, CA 94089
Phone: 408-732-9162, Fax: 408-732-9164
http://www.baclcorp.com

Dear Sir or Madam:

We, *Zebra Technologies Corporation*, hereby declare that product: Wireless Printer, models: *ZP620, ZP420, ZD421, ZP506* is electrically identical with the same electromagnetic emissions and electromagnetic compatibility characteristics as model: *ZD621* tested by BACL, the results of which are featured in BACL project: *R2009141*.

A description of the differences between the tested model and those that are declared similar are as follows:

Model	Differences						
	UI	Power Supplies	Radios	Print Width	Wired Communication Options	Print Variants	Battery Capable
ZD621 (Tested Model)	LCD Touch Screen	3 separate 75W PSUs	802.11ac, BT 5.0, UHF RFID	4"	USB, USB Host, Ethernet, Serial, Combination Ethernet + Serial	Direct Thermal, Thermal Transfer	Yes
ZD421	Simple Button UI	2 separate 60W PSUs	802.11ac, BT 5.0	4"	USB, USB Host, Ethernet, Serial	Direct Thermal, Thermal Transfer, Cartridge	Yes
ZP620	LCD Touch Screen	3 separate attached 75W PSUs	802.11ac, BT 5.0, UHF RFID	2"	USB, USB Host, Ethernet, Serial, Combination Ethernet + Serial	Direct Thermal, Thermal Transfer	No
ZP420	Simple Button UI	2 separate attached 60W PSUs	802.11ac, BT 5.0	2"	USB, USB Host, Ethernet, Serial	Direct Thermal, Thermal Transfer	Yes
ZP506	Simple Button UI	2 separate attached 60W PSUs	802.11ac, BT 5.0	4"	USB, USB Host, Ethernet, Serial	Direct Thermal	No

Power supplies and battery employed are as follows:

75W supplies: FSP075-RAAN2, FSP075-RAAM, SAWA-52-312524
60W supplies: FSP060-RPAC, SAWA-31-25024
Attachable battery pack: P1091701

1 of 2 JP

Please contact me should there be need for any additional clarification or information.

Best Regards,

Nicholas Skawinski
Compliance Engineer
3 Overlook Point, Lincolnshire
IL 60069, USA

11 Annex D (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets A2LA R222 - *Specific Requirements EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system *(refer to joint ISO-ILAC-IAF Communiqué dated April 2017)*.

Presented this 2nd day of October 2018.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to February 28, 2021
Revised December 04, 2020

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

Please follow the web link below for a full ISO 17025 scope

https://www.a2la.org/scopepdf/3297-02.pdf

--- END OF REPORT ---