FCC Part 15, Subpart C
ISEDC RSS-247, ISSUE 2, February 2017

TEST REPORT

For

ChargePoint, Inc.

253 E. Hacienda Ave, Campbell, CA 95008, USA

FCC ID: W38-60SIPT
IC: 8854A-602230C

Report Type:	**Product Type:**
Class II Permissive Change	Wi-Fi & BT Module

Prepared By:	Giriraj Gurjar Test Engineer
Report Number:	R2108319-247
Report Date:	2021-10-26
Reviewed By:	Christian McCaig RF Project Engineer

Bay Area Compliance Laboratories Corp.
1274 Anvilwood Avenue,
Sunnyvale, CA 94089, USA
Tel: +1 (408) 732-9162
Fax: +1 (408) 732-9164

ACCREDITED
CERTIFICATE #3297.02

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2108319-247	Original Report	2021-10-26

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report was prepared on behalf of *ChargePoint, Inc.*, and their product model: *SU60-2230C,* FCC ID: *W38-60SIPT*, IC: 8854A-602230C, or the "EUT" as referred to in this report. The EUT is a Wi-Fi & BT module and is contained within a Network Module host device which also contains a Cell Modem and RFID Module.

1.2 Objective

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

The objective was to determine compliance with FCC Part 15.247 and ISEDC RSS-247 for Antenna Requirement, RF Exposure & Radiated Spurious Emissions.

This project was a Permissive Change II submission for the purpose of changing the Wifi/BT module antenna used by the EUT, disabling DFS band and enabling co-location with RFID module (FCC ID: W38-UICFG, IC: 8854A-UICFG), and cell modem (FCC ID: W38-201903EG25G, IC: 8854A-201903EG25G).

1.3 Related Submittal(s)/Grant(s)

Equipment Class: NII, FCC ID: W38-60SIPT, IC: 8854A-602230C

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	±0.86 dB
Power Spectral Density, conducted	±0.86 dB
Unwanted Emissions, conducted	±2.76 dB
All emissions, radiated	±4.94 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 - ISEDC) 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.

2.2 EUT Exercise Software

The EUT was configured to transmit through Command Prompt. The software is compliant with the standard requirements being tested against.

Power settings:

2.4 GHz Wifi:

Modulation	Frequency (MHz)	Power Setting
802.11b	2412	19
	2437	19
	2462	18
802.11g	2412	17
	2437	19
	2462	15
802.11n20	2412	16
	2437	19
	2462	13
802.11n40	2422	14
	2437	17
	2452	12

Data Rates Tested:
802.11b mode: 1Mbps
802.11g mode: 6Mbps
802.11n HT20 mode: MCS0
802.11n HT40 mode: MCS0

Note: Power settings were determined from settings used in previous test report of device (Test Report FR740701AC Rev. 02 issued by International Certification Corp. on 07/21/2017).

BT Classic/BLE:

Modulation	Frequency (MHz)	Power Setting
DH1	2402	Default
	2441	Default
	2480	Default
2-DH1	2402	Default
	2441	Default
	2480	Default
3-DH1	2402	Default
	2441	Default
	2480	Default
BLE	2402	10
	2440	10
	2480	10

Data Rates Tested:
DH1: 1Mbps
2-DH1: 2Mbps
3-DH1: 3Mbps
BLE: 1Mbps

Note: Power settings were determined from settings used in previous test reports of device (Test Report FR740701AE Rev. 02 issued by International Certification Corp. on 07/21/2017 for BLE and Test Report FR740701AD Rev. 02 issued by International Certification Corp. on 07/21/2017 for BT Classic).

2.3 Duty Cycle Correction Factor

According to KDB 558074 D01 DTS Meas Guidance v05r02 section 6.0:

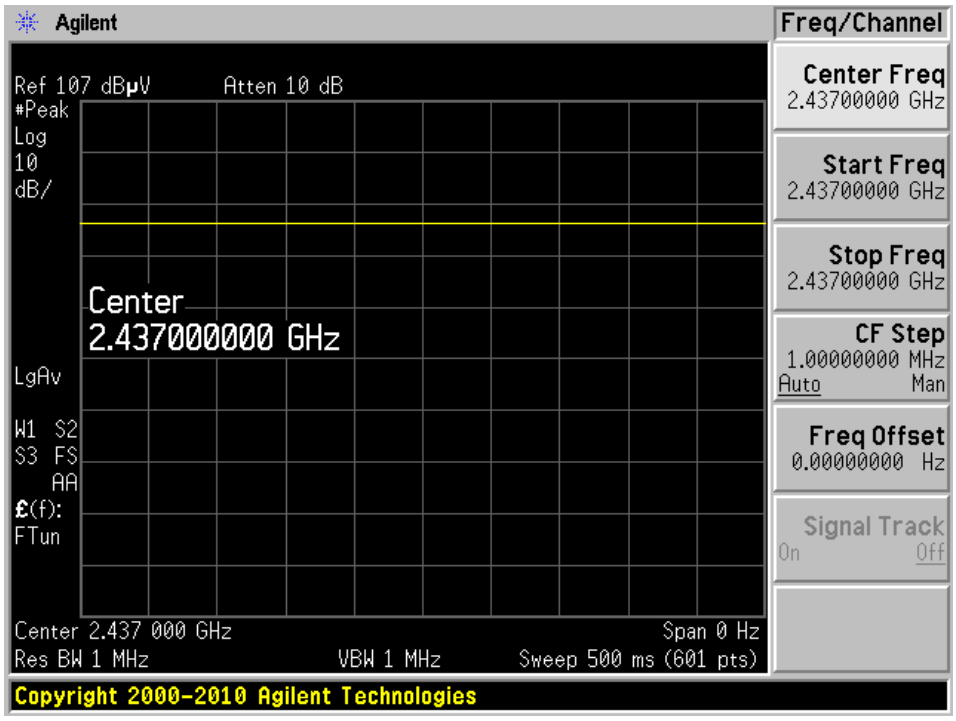
Preferably, all measurements of maximum conducted (average) output power will be performed with the EUT transmitting continuously (i.e., with a duty cycle of greater than or equal to 98%). When continuous operation cannot be realized, then the use of sweep triggering/signal gating techniques can be utilized to ensure that measurements are made only during transmissions at the maximum power control level. Such sweep triggering/signal gating techniques will require knowledge of the minimum transmission duration (T) over which the transmitter is on and is transmitting at its maximum power control level for the tested mode of operation. Sweep triggering/signal gating techniques can then be used if the measurement/sweep time of the analyzer can be set such that it does not exceed T at any time that data is being acquired (i.e., no transmitter off-time is to be considered).

Radio Mode	On Time (ms)	Period (ms)	Duty Cycle (%)	Duty Cycle Correction Factor (dB)
802.11b	-	-	100	0
802.11g	-	-	100	0
802.11n20	-	-	100	0
802.11n40	-	-	100	0
DH1	0.383	1.25	30.64	5.14
2-DH1	0.383	1.25	30.64	5.14
3-DH1	0.383	1.25	30.64	5.14
BLE	2.117	2.5	84.68	0.72

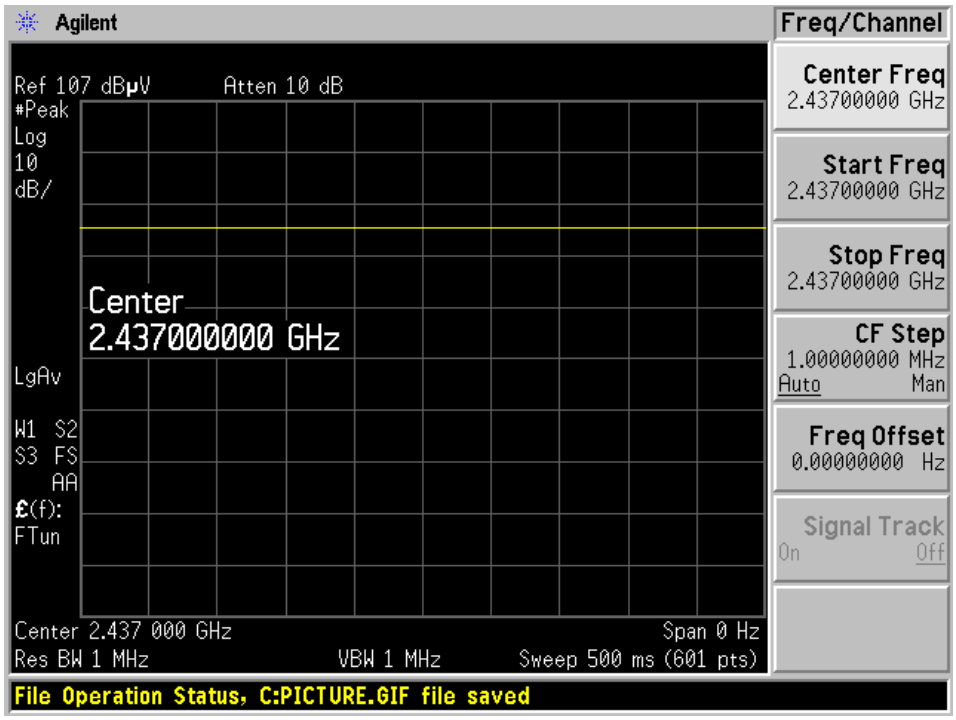
Duty Cycle = On Time (ms)/ Period (ms)
Duty Cycle Correction Factor (dB) = 10*log(1/Duty Cycle)

Please refer to the following plots.

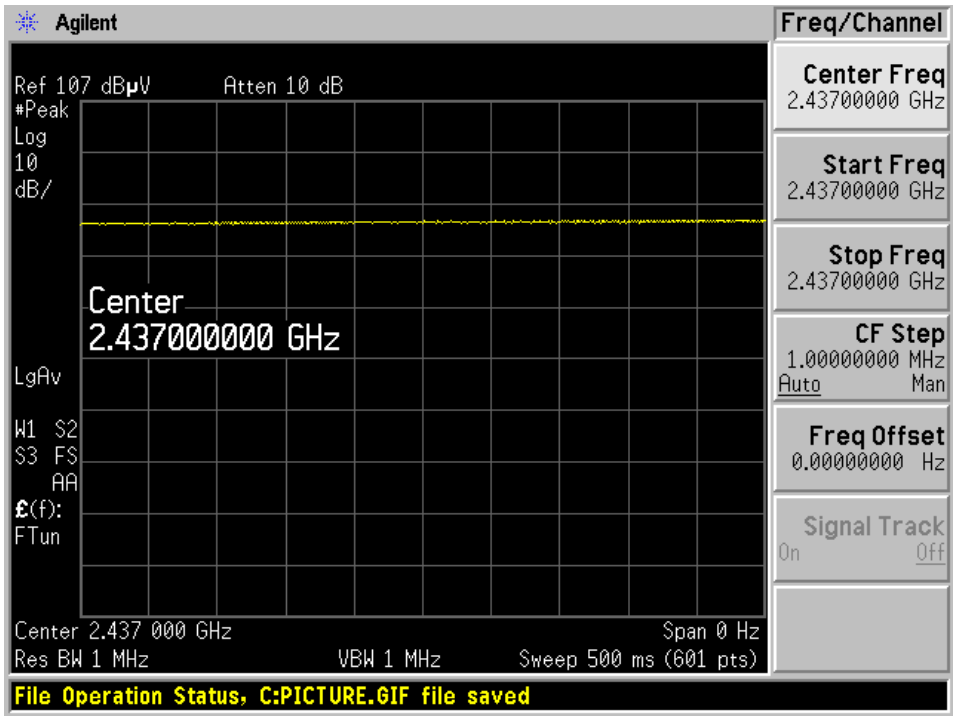
802.11b mode



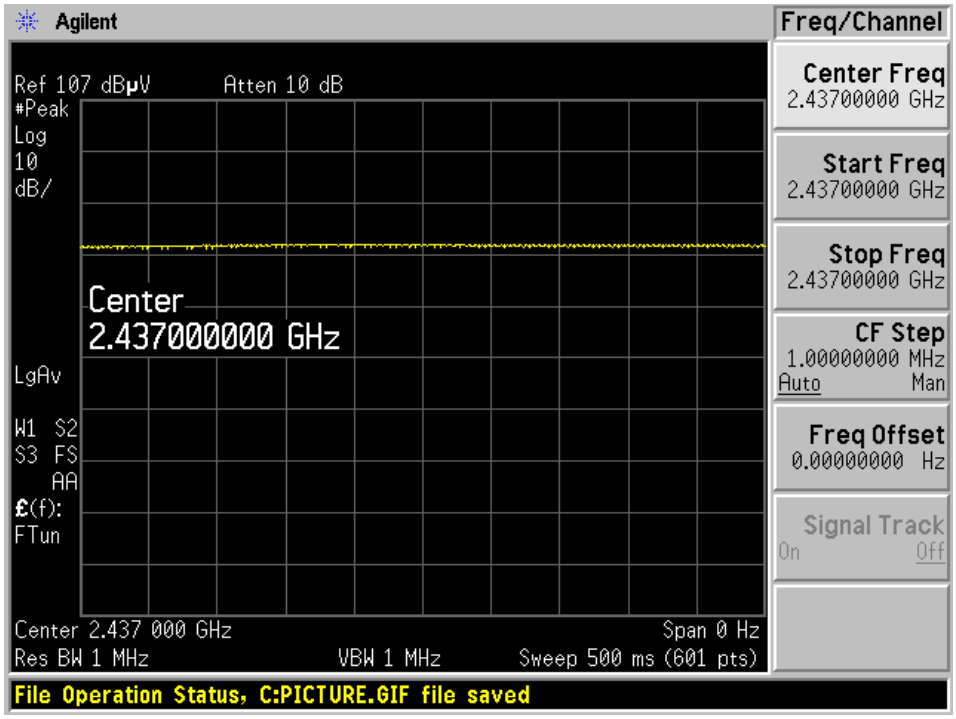
802.11g mode



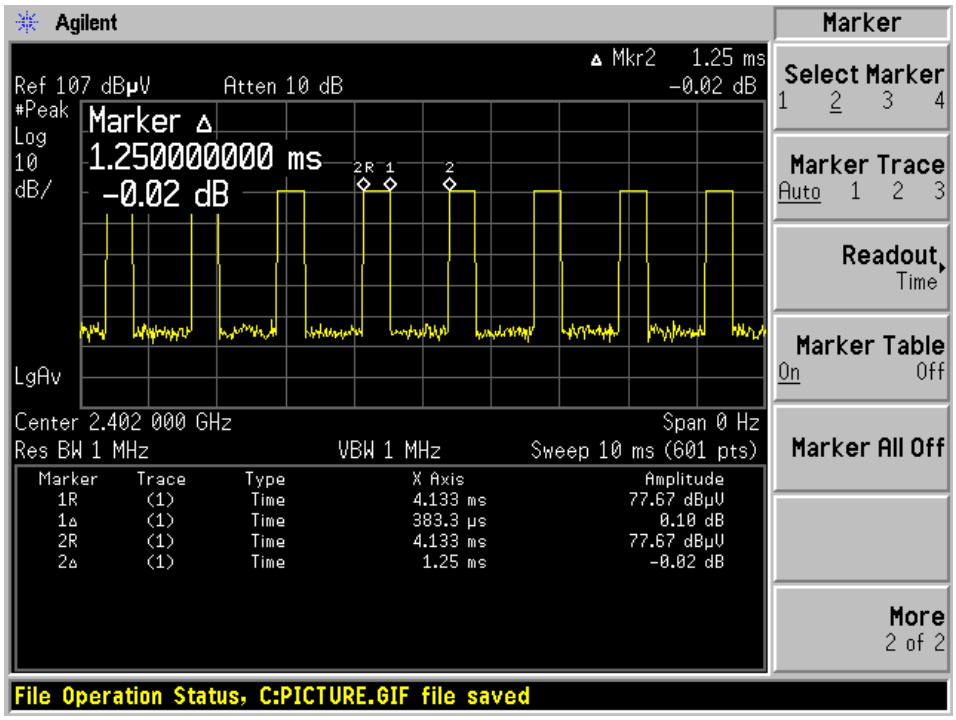
802.11n20 mode



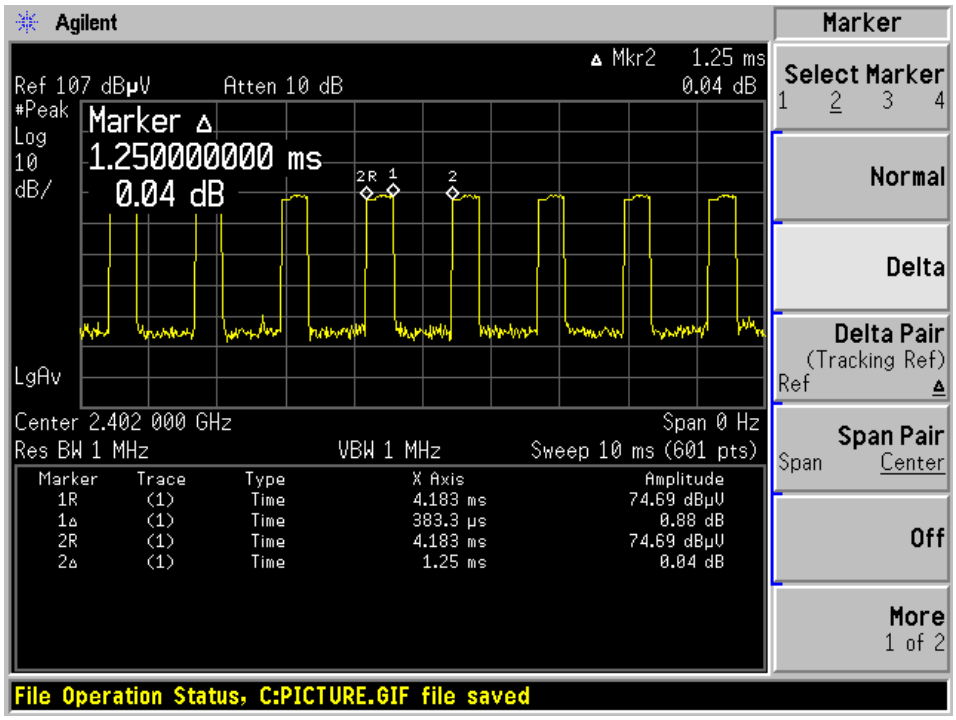
802.11n40 mode



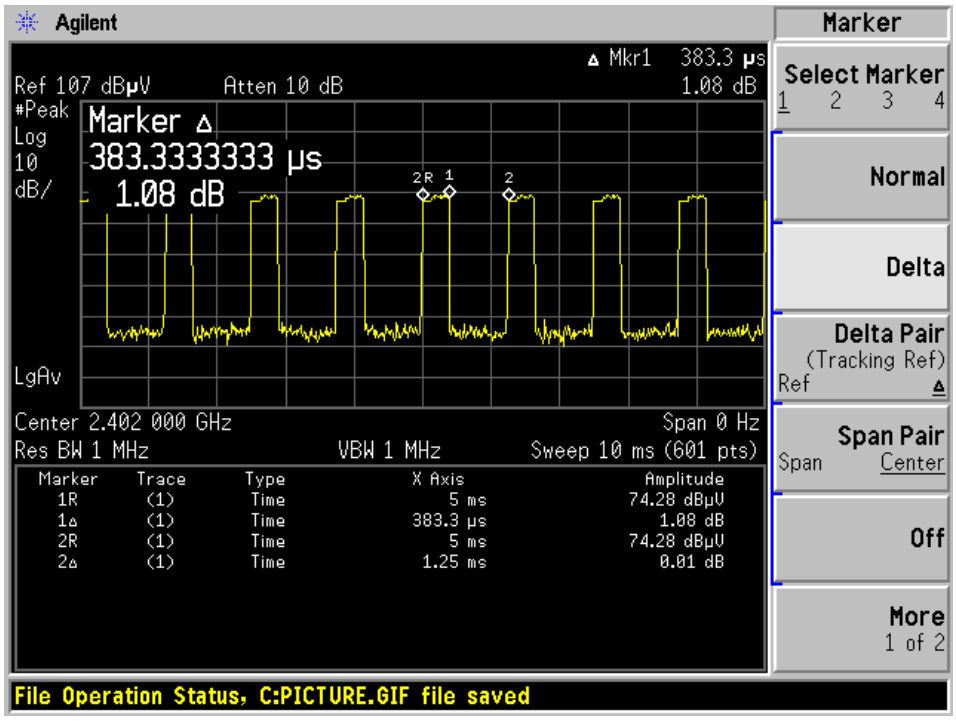
DH1


Agilent
Marker
Mkr2 1.25 ms
Ref 107 dBµV
Atten 10 dB
-0.02 dB
#Peak
Log
10
dB/
Marker Δ
1.250000000 ms
-0.02 dB
2R 1
2
LgAv
Center 2.402 000 GHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 10 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 4.133 ms 77.67 dBµV
1Δ (1) Time 383.3 µs 0.10 dB
2R (1) Time 4.133 ms 77.67 dBµV
2Δ (1) Time 1.25 ms -0.02 dB
Select Marker
1 2 3 4
Marker Trace
Auto 1 2 3
Readout
Time
Marker Table
On Off
Marker All Off
More
2 of 2
File Operation Status, C:PICTURE.GIF file saved

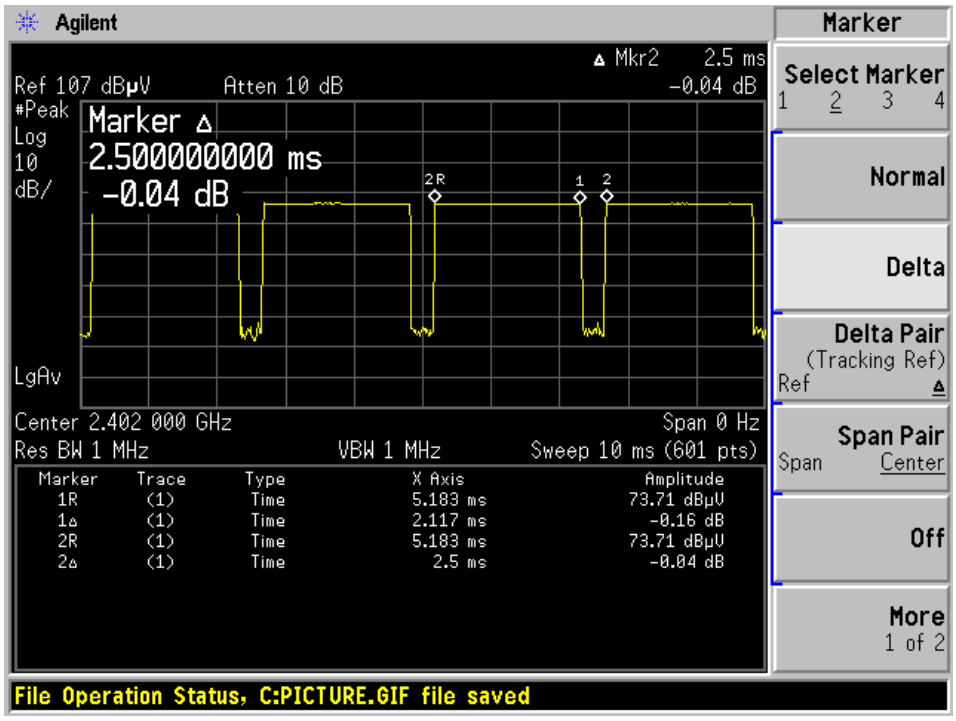
2-DH1


Agilent
Marker
Mkr2 1.25 ms
Ref 107 dBµV
Atten 10 dB
0.04 dB
#Peak
Log
10
dB/
Marker Δ
1.250000000 ms
0.04 dB
2R 1
2
LgAv
Center 2.402 000 GHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 10 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 4.183 ms 74.69 dBµV
1Δ (1) Time 383.3 µs 0.88 dB
2R (1) Time 4.183 ms 74.69 dBµV
2Δ (1) Time 1.25 ms 0.04 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:PICTURE.GIF file saved

3-DH1


Agilent
Marker
Mkr1 383.3 µs
Ref 107 dBµV
Atten 10 dB
1.08 dB
#Peak
Log
10
dB/
Marker Δ
383.3333333 µs
1.08 dB
LgAv
Center 2.402 000 GHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 10 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 5 ms 74.28 dBµV
1Δ (1) Time 383.3 µs 1.08 dB
2R (1) Time 5 ms 74.28 dBµV
2Δ (1) Time 1.25 ms 0.01 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:PICTURE.GIF file saved

BLE


Agilent
Marker
Mkr2 2.5 ms
Ref 107 dBµV
Atten 10 dB
-0.04 dB
#Peak
Log
10
dB/
Marker Δ
2.500000000 ms
-0.04 dB
LgAv
Center 2.402 000 GHz
Span 0 Hz
Res BW 1 MHz
VBW 1 MHz
Sweep 10 ms (601 pts)
Marker Trace Type X Axis Amplitude
1R (1) Time 5.183 ms 73.71 dBµV
1Δ (1) Time 2.117 ms -0.16 dB
2R (1) Time 5.183 ms 73.71 dBµV
2Δ (1) Time 2.5 ms -0.04 dB
Select Marker
1 2 3 4
Normal
Delta
Delta Pair
(Tracking Ref)
Ref
Span Pair
Span Center
Off
More
1 of 2
File Operation Status, C:PICTURE.GIF file saved

2.4 Equipment Modifications

N/A

2.5 Local Support Equipment

Manufacturer	Description	Model
Dell	Laptop	Latitude E6410

2.6 Remote Support Equipment

Manufacturer	Description	Model
Mean Well Enterprises Co., LTD.	AC/DC Switching Adaptor	SGA40U48

Note: Power Adaptor was only used for test purposes. In normal operation, device will be powered by 48VDC from host

2.7 Interface Ports and Cabling

Cable Description	Length (m)	To	From
Ethernet Cable	< 1 m	EUT	Laptop

3 Summary of Test Results

FCC/ISEDC Rules	Description of Test	Results
FCC §15.203 ISEDC RSS-Gen §6.8	Antenna Requirements	Compliant
FCC §2.1091, §15.247(i) ISEDC RSS-102	RF Exposure	Compliant
FCC §15.209, §15.247(d) ISEDC RSS-247 §5.5 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

Antenna usage	Frequency Range (MHz)	Maximum Antenna Gain (dBi)	Antenna Type
2.4GHz Wi-Fi, BT Classic and BLE	2400-2483.5	1.25	Chip

Note: The antennas used by the EUT are permanent attached antennas.
Note: Antenna info is information provided by customer.

5 FCC §2.1091, §15.407(f) & ISEDC RSS-102 - RF Exposure

5.1 Applicable Standards

According to FCC §15.247(i) and §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to KDB 447 498 Section (7.2), "simultaneous transmission of MPE test exclusion applies when the sum of the MPE ratios for all simultaneous transmitting antennas incorporated in a host device, based on calculated or measured field strengths or power density, is ≤ 1.0. The MPE ratio of each antenna is determined at the minimum *test separation distance* required by the operating configurations and exposure conditions of the host device, according to the ratio of field strengths or power density to MPE limit, at the test frequency.

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 (minutes)
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

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

Before equipment certification is granted, the procedure of IC RSS-102 must be followed concerning the exposure of humans to RF field.

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

Note: According to MIMOFCC KDB 662911 D02 MIMO with Cross Polarized Antenna v01, Where an FCC rule specifies limits in radiated terms such as EIRP or ERP, the limits apply to the maximum emission that would be observed by a linearly polarized measurement antenna. Therefore, the highest output power from single antenna power was selected to calculate in this section.

5.3 MPE Results

Worst Case: 802.11g, 2437 MHz

Maximum output power at antenna input terminal (dBm):	18.10
Maximum output power at antenna input terminal (mW):	64.57
Prediction distance (cm):	20
Prediction frequency (MHz):	2437
Maximum Directional Antenna Gain, typical (dBi):	1.25
Maximum Antenna Gain (numeric):	1.33
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0171
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement FCC MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0171 mW/cm^2. Limit is 1.0 mW/cm^2.

Worst Case: Bluetooth DH1, 2402 MHz

Maximum output power at antenna input terminal (dBm):	10.79
Maximum output power at antenna input terminal (mW):	11.99
Prediction distance (cm):	20
Prediction frequency (MHz):	2402
Maximum Directional Antenna Gain, typical (dBi):	1.25
Maximum Antenna Gain (numeric):	1.33
Power density of prediction frequency at 20.0 cm (mW/cm^2):	0.0032
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	1.0

The device is compliant with the requirement FCC MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0032 mW/cm^2. Limit is 1.0 mW/cm^2.

Radio Co-location

Simultaneous transmission among 2.4 GHz Wi-Fi, Bluetooth and 5 GHz Wi-Fi is not supported.

Worst Case Co-location MPE Calculation: BT + Cellular + RFID

Radio	Max Conducted Power (dBm)	Evaluated Distance (cm)	Worst-Case Exposure Level	Limit	Worst-Case Ratios	Sum of Ratios	Limit
Worst Case							
BT	10.79	20	0.0032 mW/cm^2	1.0 mW/cm^2	0.32%	23.69%	100%
Cellular	25.81	20	0.1284 mW/cm^2	0.5495 mW/cm^2	23.37%		
RFID	-21.65	20	0.00000137 mW/cm^2	1 mW/cm^2	0.000137%		

Worst Case Co-location MPE Calculation: Wifi + Cellular + RFID

Radio	Max Conducted Power (dBm)	Evaluated Distance (cm)	Worst-Case Exposure Level	Limit	Worst-Case Ratios	Sum of Ratios	Limit
Worst Case							
2.4GHz Wifi	18.10	20	0.0171 mW/cm^2	1.0 mW/cm^2	1.71%	25.08%	100%
Cellular	25.81	20	0.1284 mW/cm^2	0.5495 mW/cm^2	23.37%		
RFID	-21.65	20	0.00000137 mW/cm^2	1 mW/cm^2	0.000137%		

Note: Cellular Module FCC ID: W38-201903EG25G, IC: 8854A-201903EG25G

Note: RFID Module FCC ID: W38-UICFG, IC: 8854A-UICFG

5.4 RF exposure evaluation exemption for IC

Worst Case: 802.11g, 2437 MHz

Maximum EIRP power = 18.1dBm + 1.25 dBi = 19.35 dBm which is less than $1.31\times10^{-2}f^{0.6834}$ = 2.703 W = 34.32 dBm

Worst Case: Bluetooth DH1, 2402 MHz

Maximum EIRP power = 10.79 dBm + 1.25 dBi = 12.04 dBm which is less than $1.31\times10^{-2}f^{0.6834}$ = 2.68 W = 34.28 dBm

Therefore the RF exposure Evaluation is not required.

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

6.1 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 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 ISEDC RSS-Gen 8.9,

Except when the requirements applicable to a given device state otherwise, emission from licence-exempt transmitters shall company with the field strength limits shown in the table below. Additional, the level of any transmitter emission shall not exceed the level of the transmitter's fundamental emission.

General Field Strength Limits for Licence-Exemption Transmitters at Frequencies above 30 MHz

Frequency (MHz)	Field Strength (µv/m at 3 meters)
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 licence-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 ISEDC 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.

6.2 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.

6.3 Test Procedure

For the radiated emissions test, the EUT host, and all support equipment power cords was 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 should be changed the polarization both of horizontal and vertical.

The spectrum analyzer or receiver is 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 / Sweep = Auto

6.4 Corrected Amplitude & 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

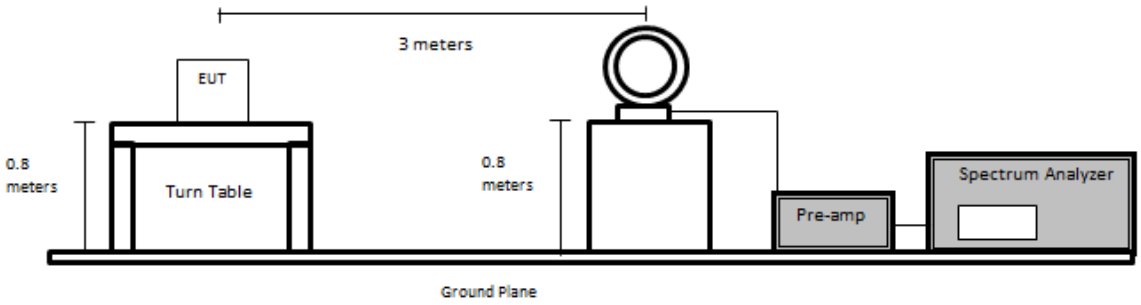
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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:

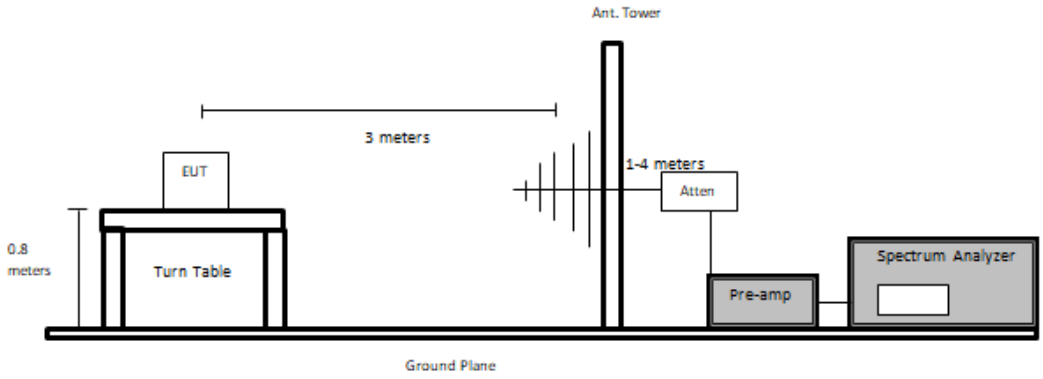
Margin = Corrected Amplitude – Limit

6.5 Test Setup Block Diagram

9 kHz to 30 MHz:

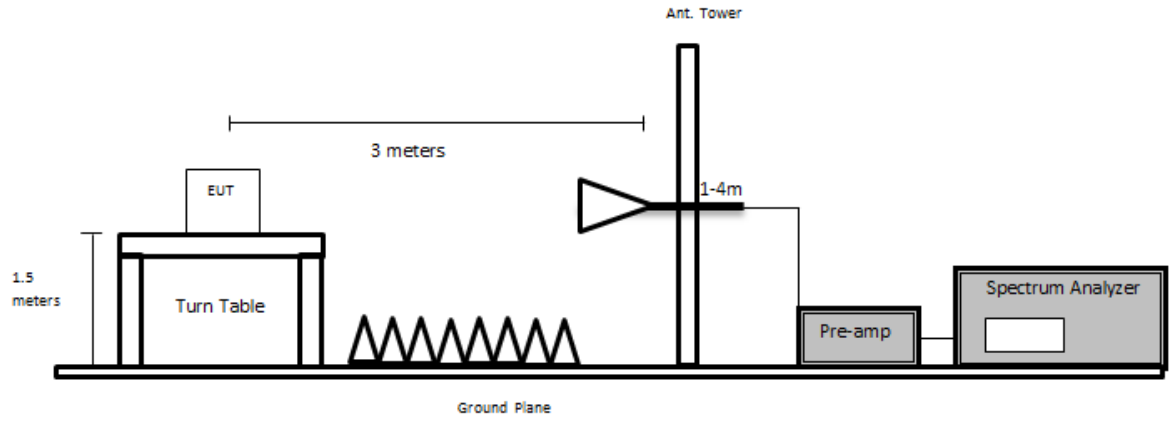


30 MHz to 1 GHz:

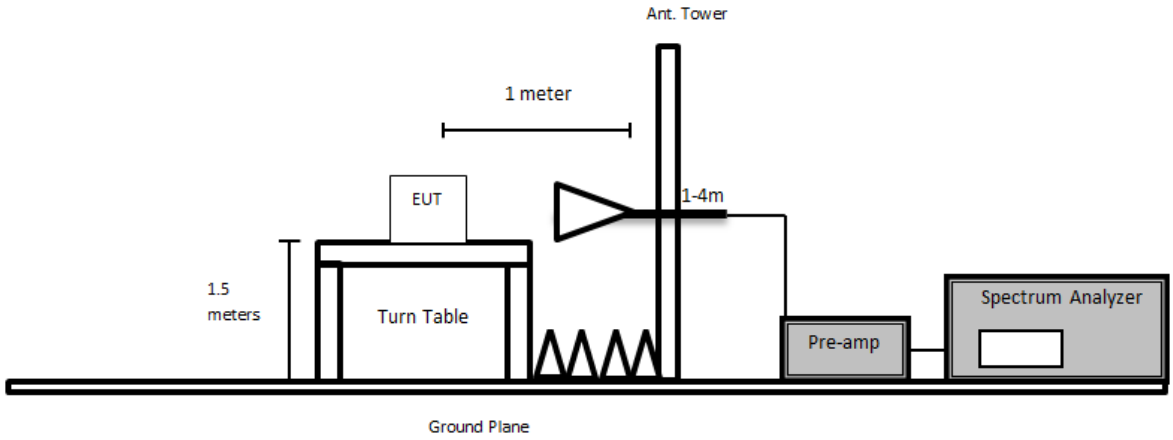


1 GHz to 18 GHz (Asset #187 Antenna used):

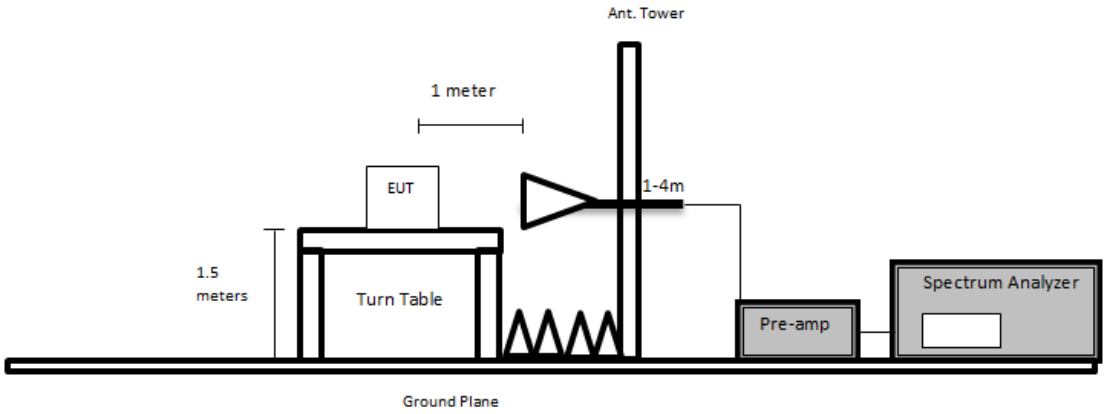
At 3 meters:



At 1 meter:



18 GHz to 26.5 GHz (Asset #91 Antenna used):



6.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
0322	Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950K03	100337	2021-03-09	2 years
0811	Keysight Technologies	RF Limiter	11867A	MY42243 052	2020-10-27	1 year
0287	Agilent	Spectrum Analyzer	E4446A	US443003 86	2021-04-27	1 year
-	Sunol Science Corp	System Controller	SC110V	122303-1	N/R	N/A
0658	HP	Pre-Amplifier	8449B OPT HO2	3008A011 3	2021-05-06	1 year
0827	AH Systems	Preamplifier	PAM 1840 VH	170	2021-08-03	1 year
0091	Wisewave	Horn Antenna	ARH-4223-02	10555-02	2020-02-05	2 years
0187	A.R.A	Antenna, Horn	DRG-118/A	1132	2020-02-25	2 years
0321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2	2019-11-20	2 years
0459	HP	Pre Amplifier	8447D	2443A043 74	2020-08-17	15 months
-	-	RF cable	-	-	Each time[1]	N/A
-	-	Notch Filter	-	-	Each time[1]	N/A
1077	Insulted Wire Corp.	157 Series 2.92 SM (x2) Armored 33 ft. Cable	KPS-1571AN-3960-KPS	DC 1917	2021-03-03	1 year
1081	MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35\'	LMR400UF	BACL190 4161	2021-06-18	1 year
1101	IW Microwave	157 Series Cable Armored with 2.92mm Male Plugs	KPS-1571AN-2400	DC 1922	2021-07-06	1 year
0445	Sonoma Instruments	Pre Amplifier	315	303125	2021-08-03	1 year
0393	Com-Power	Antenna, Loop Active	AL-130	17043	2021-05-05	2 years
1151	BACL	5m3 Sensitivity Box	1	2	2020-10-27	1 year

Note[1]: equipment 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".*

6.7 Test Environmental Conditions

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

The testing was performed by Deepak Mishra and Giriraj Gurjar from 2021-10-15 to 2021-10-25 in 5m chamber 3 and 10 chamber 1.

6.8 Summary of Test Results

According to the data hereinafter, the EUT complied with FCC 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)**	**Configuration**
-4.62	2483.5	Vertical	2.4GHz Wifi, G mode, 2462 MHz

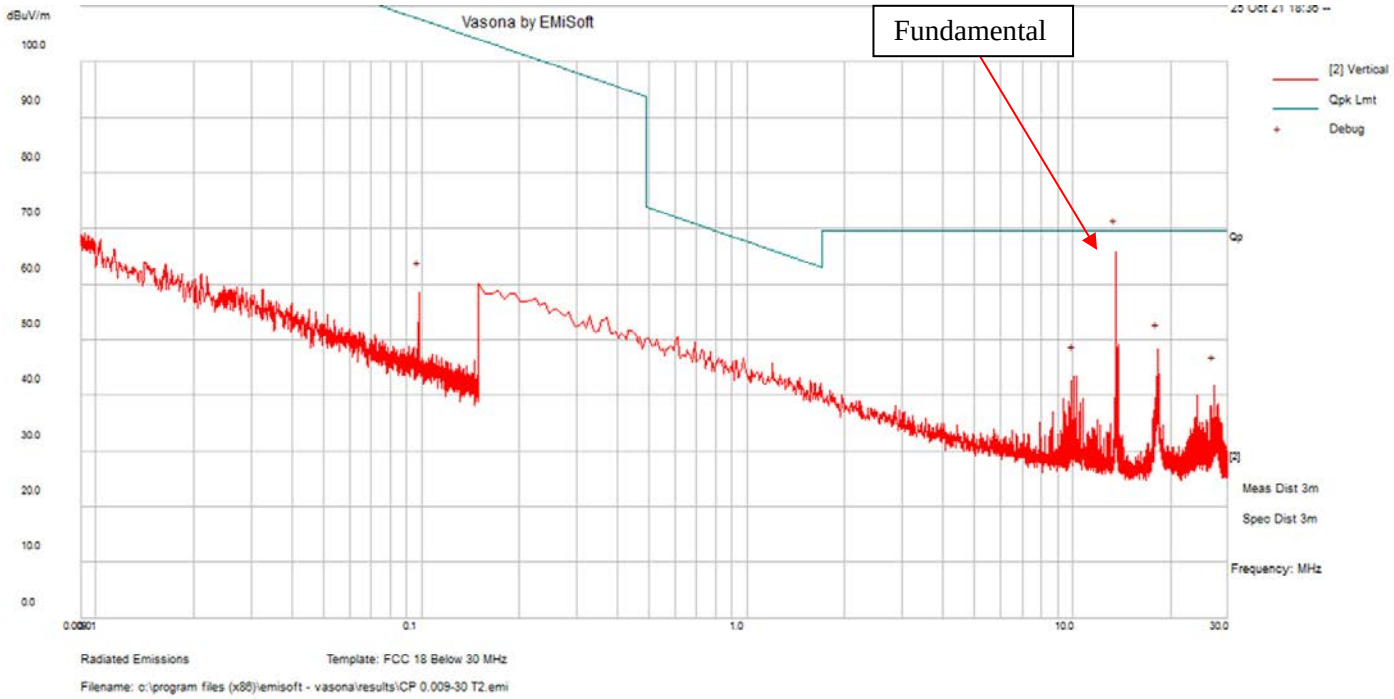
Please refer to the following table and plots for specific test result details

6.9 Radiated Emissions Test Results

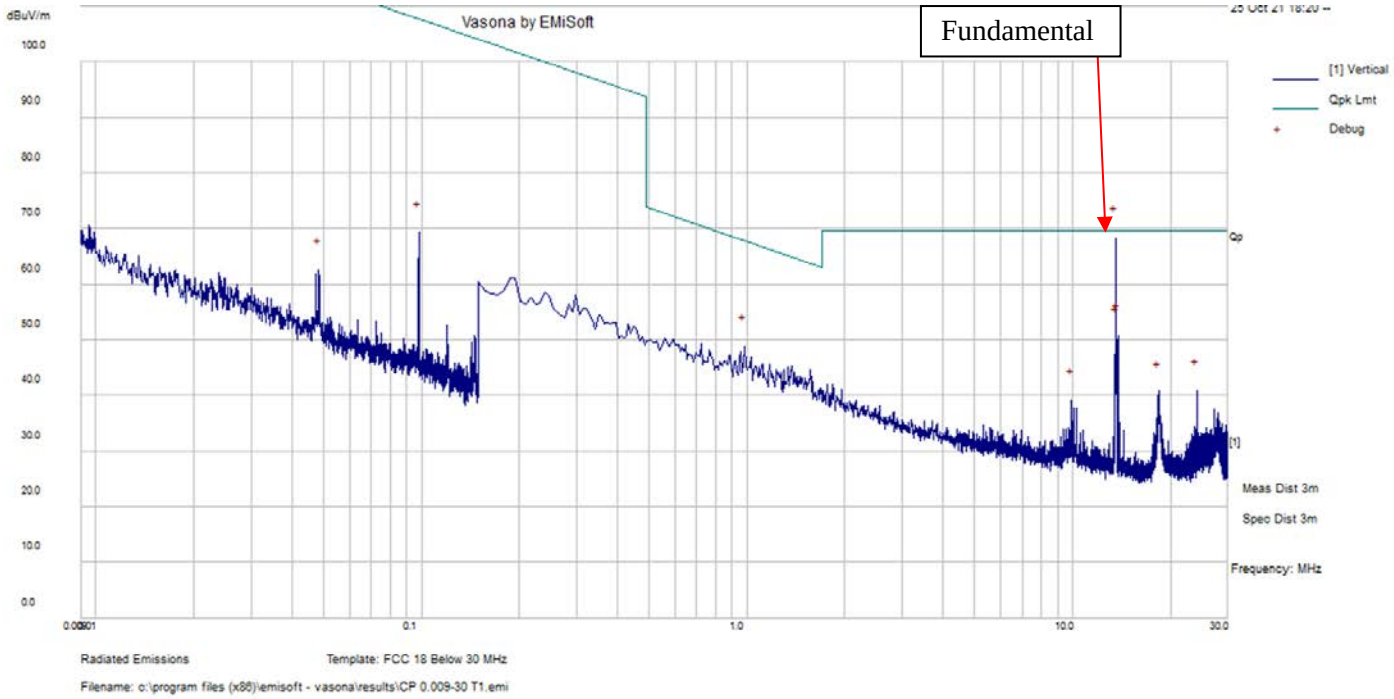
1) Below 30 MHz Radiated Field Strength at 3 meters

Worst Case: 2.4GHz Wifi (g mode, 2437 MHz) + Cellular Modem (WCDMA Band II) + RFID

Perpendicular:

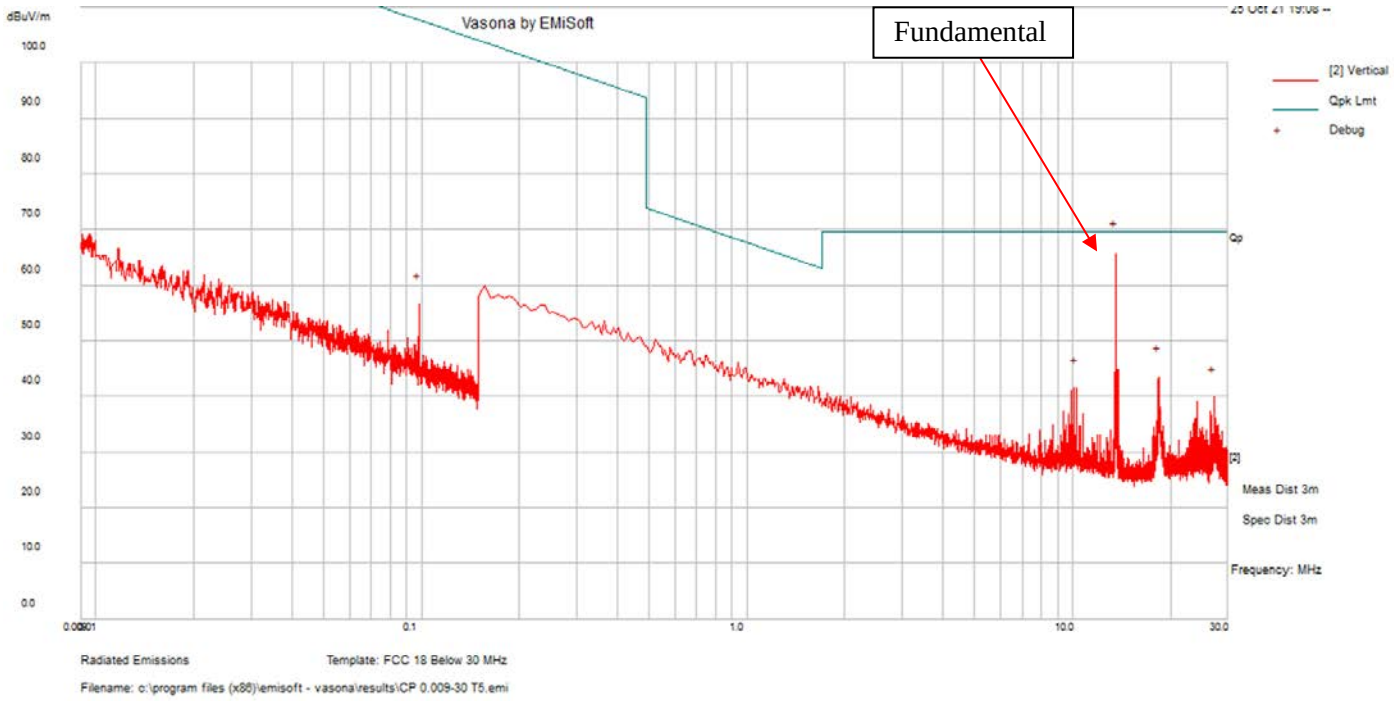


Parallel:

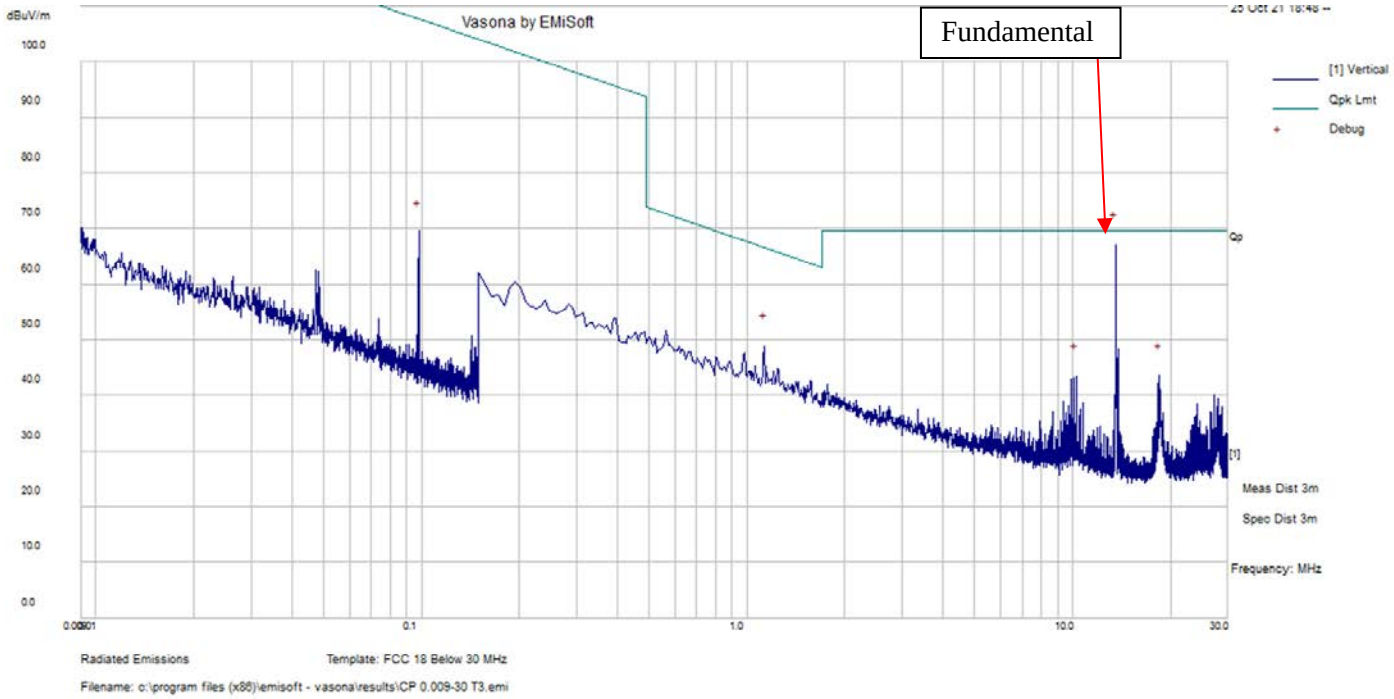


Worst Case: BT (DH1, 2402 MHz) + Cellular Modem (WCDMA Band II) + RFID

Perpendicular:

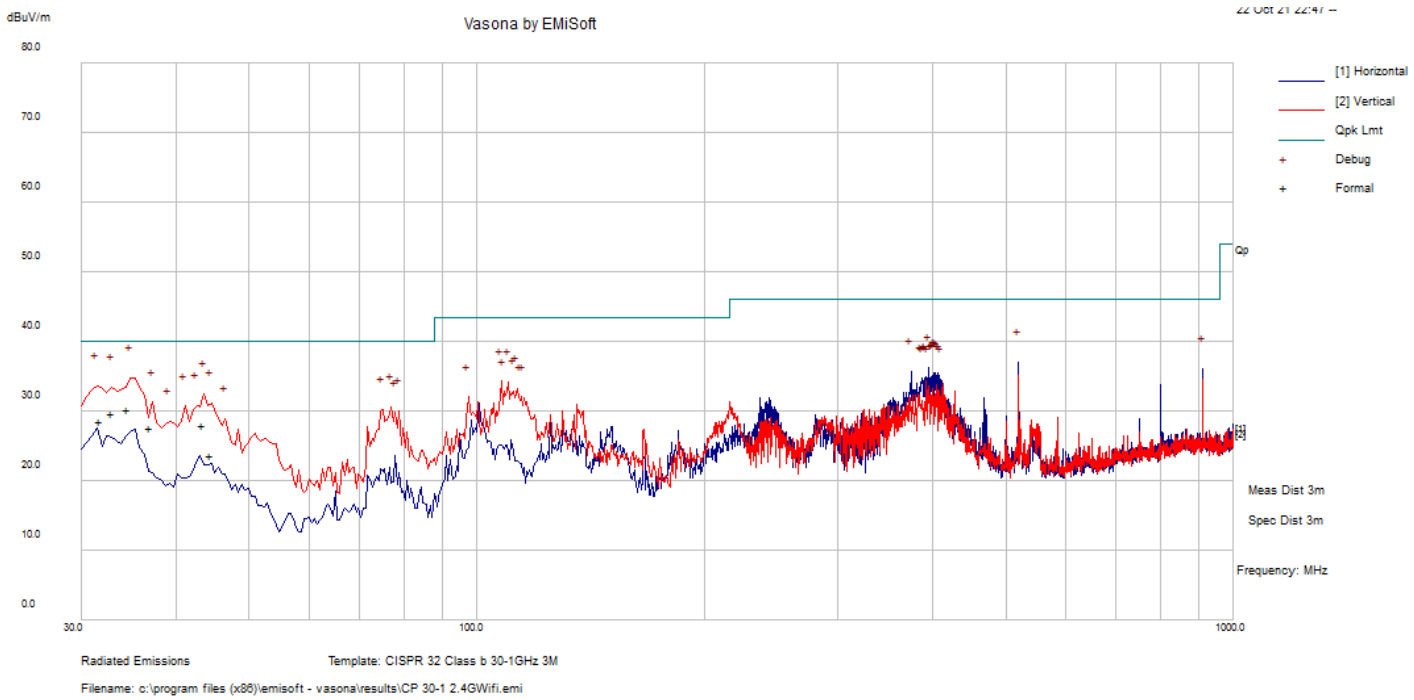


Parallel:



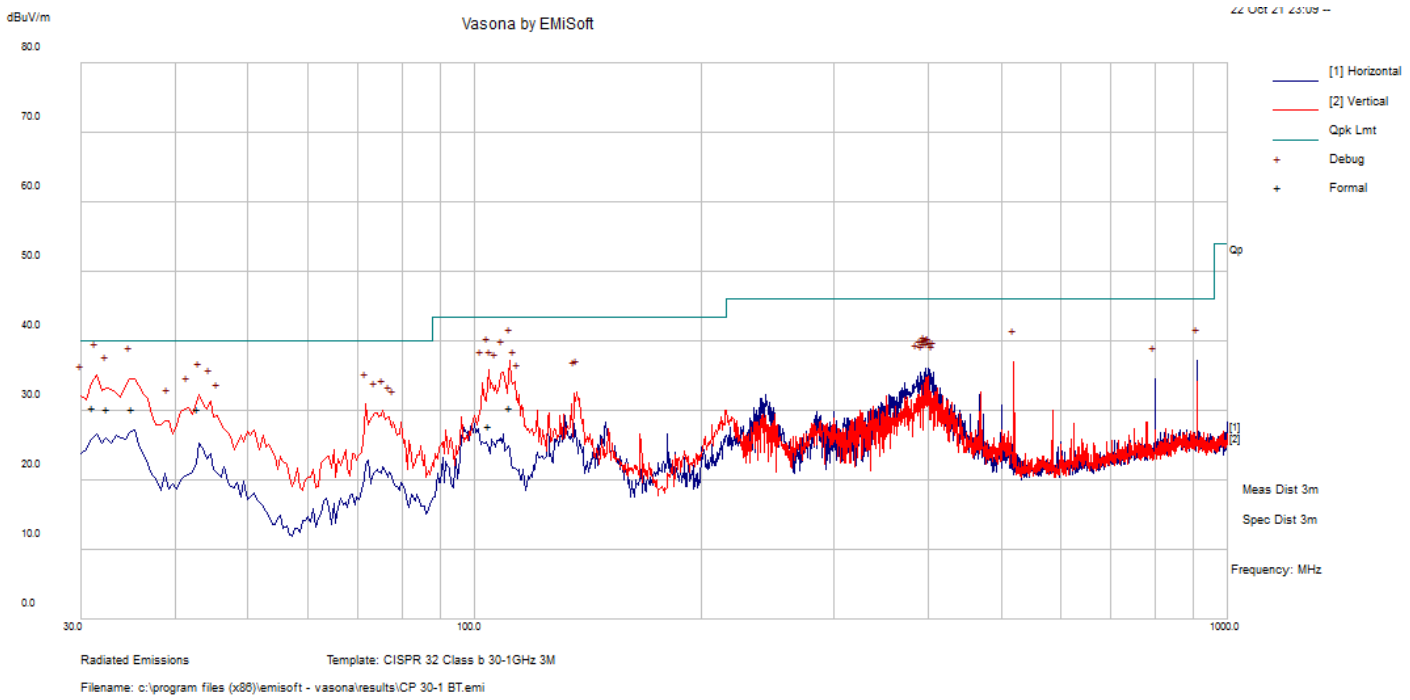
2) 30 MHz – 1 GHz Worst Case, Measured at 3 meters

Worst Case: 2.4GHz Wifi (g mode, 2437 MHz) + Cellular Modem (WCDMA Band II) + RFID



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
34.54025	42.94	-12.76	30.18	102	V	239	40	-9.82	QP
31.72825	39.21	-10.59	28.62	121	V	325	40	-11.38	QP
32.88575	41.15	-11.48	29.67	137	V	361	40	-10.33	QP
43.44275	47.52	-19.54	27.98	120	V	253	40	-12.02	QP
37.0315	42.23	-14.7	27.53	116	V	199	40	-12.47	QP
44.47575	43.77	-20.11	23.66	251	V	285	40	-16.34	QP

Worst Case: BT (DH1, 2402 MHz) + Cellular Modem (WCDMA Band II) + RFID



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
31.20625	40.61	-10.22	30.39	100	V	276	40	-9.61	QP
35.05875	43.44	-13.22	30.22	122	V	259	40	-9.78	QP
111.56625	48.22	-17.69	30.53	103	V	320	43.5	-12.97	QP
32.55425	41.49	-11.22	30.27	100	V	0	40	-9.73	QP
104.4265	46.87	-19.07	27.8	121	V	287	43.5	-15.7	QP
42.85325	49.38	-19.17	30.21	128	V	246	40	-9.79	QP

3) 1–18 GHz Measured at 1 meter and 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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	30.52	80	219	V	33.10	4.91	-	68.53	84	-15.47	Peak
2390	19.78	80	219	V	33.10	4.91	-	57.79	64	-6.21	Ave
2390	29.39	0	168	H	33.10	4.91	-	67.40	84	-16.60	Peak
2390	18.71	0	168	H	33.10	4.91	-	56.72	64	-7.28	Ave
4824	51.63	0	158	V	35.15	9.11	38.37	57.52	84	-26.48	Peak
4824	46.88	0	158	V	35.15	9.11	38.37	52.77	64	-11.23	Ave
4824	51.83	332	150	H	35.15	9.11	38.37	57.72	84	-26.28	Peak
4824	47.18	332	150	H	35.15	9.11	38.37	53.07	64	-10.93	Ave
Middle Channel 2437 MHz											
4874	52.47	0	180	V	35.08	9.11	38.37	58.29	84	-25.71	Peak
4874	47.03	0	180	V	35.08	9.11	38.37	52.85	64	-11.15	Ave
4874	52.86	145	150	H	35.08	9.11	38.37	58.68	84	-25.32	Peak
4874	48.76	145	150	H	35.08	9.11	38.37	54.58	64	-9.42	Ave
High Channel 2462 MHz											
2483.5	31.63	57	245	V	32.94	4.91	-	69.48	84	-14.52	Peak
2483.5	20.31	57	245	V	32.94	4.91	-	58.16	64	-5.84	Ave
2483.5	30.23	43	150	H	32.94	4.91	-	68.08	84	-15.92	Peak
2483.5	21.62	43	150	H	32.94	4.91	-	59.47	64	-4.53	Ave
4924	48.92	183	150	V	35.06	9.11	38.37	54.72	84	-29.28	Peak
4924	36.78	183	150	V	35.06	9.11	38.37	42.58	64	-21.42	Ave
4924	52.40	0	150	H	35.06	9.11	38.37	58.20	84	-25.80	Peak
4924	46.51	0	150	H	35.06	9.11	38.37	52.31	64	-11.69	Ave

Note: Measurements made at 1 meter.

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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	33.66	66	220	V	33.10	4.91	-	71.67	84	-12.33	Peak
2390	19.10	66	220	V	33.10	4.91	-	57.11	64	-6.89	Ave
2390	34.60	42	150	H	33.10	4.91	-	72.61	84	-11.39	Peak
2390	19.75	42	150	H	33.10	4.91	-	57.76	64	-6.24	Ave
4824	48.27	198	150	V	35.15	9.11	38.37	54.16	84	-29.84	Peak
4824	36.53	198	150	V	35.15	9.11	38.37	42.42	64	-21.58	Ave
4824	50.30	64	169	H	35.15	9.11	38.37	56.19	84	-27.81	Peak
4824	39.38	64	169	H	35.15	9.11	38.37	45.27	64	-18.73	Ave
Middle Channel 2437 MHz											
4874	49.91	87	140	V	35.06	9.11	38.37	55.71	84	-28.29	Peak
4874	37.84	87	140	V	35.06	9.11	38.37	43.64	64	-20.36	Ave
4874	55.75	77	150	H	35.06	9.11	38.37	61.55	84	-22.45	Peak
4874	43.75	77	150	H	35.06	9.11	38.37	49.55	64	-14.45	Ave
High Channel 2462 MHz											
2483.5	33.30	233	202	V	32.94	4.91	-	71.15	84	-12.85	Peak
2483.5	21.24	233	202	V	32.94	4.91	-	59.09	64	-4.91	Ave
2483.5	35.86	45	150	H	32.94	4.91	-	73.71	84	-10.29	Peak
2483.5	21.92	45	150	H	32.94	4.91	-	59.77	64	-4.23	Ave
4924	48.68	307	150	V	35.06	9.11	38.37	54.48	84	-29.52	Peak
4924	36.62	307	150	V	35.06	9.11	38.37	42.42	64	-21.58	Ave
4924	50.48	6	192	H	35.06	9.11	38.37	56.28	84	-27.72	Peak
4924	38.30	6	192	H	35.06	9.11	38.37	44.10	64	-19.90	Ave

Note: Measurements made at 1 meter.

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/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2412 MHz											
2390	33.66	66	220	V	33.10	4.91	-	71.67	84	-12.33	Peak
2390	19.10	66	220	V	33.10	4.91	-	57.11	64	-6.89	Ave
2390	34.60	42	150	H	33.10	4.91	-	72.61	84	-11.39	Peak
2390	19.75	42	150	H	33.10	4.91	-	57.76	64	-6.24	Ave
4824	49.94	37	150	V	35.08	9.11	38.37	55.76	84	-28.24	Peak
4824	35.71	37	150	V	35.08	9.11	38.37	41.53	64	-22.47	Ave
4824	49.48	56	150	H	35.08	9.11	38.37	55.30	84	-28.70	Peak
4824	38.37	56	150	H	35.08	9.11	38.37	44.19	64	-19.81	Ave
Middle Channel 2437 MHz											
4874	50.36	2	191	V	35.06	9.11	38.37	56.16	84	-27.84	Peak
4874	38.32	2	191	V	35.06	9.11	38.37	44.12	64	-19.88	Ave
4874	56.35	69	180	H	35.06	9.11	38.37	62.15	84	-21.85	Peak
4874	43.72	69	180	H	35.06	9.11	38.37	49.52	64	-14.48	Ave
High Channel 2462 MHz											
2483.5	32.14	88	198	V	32.94	4.91	-	69.99	84	-14.01	Peak
2483.5	18.32	88	198	V	32.94	4.91	-	56.17	64	-7.83	Ave
2483.5	32.21	348	150	H	32.94	4.91	-	70.06	84	-13.94	Peak
2483.5	19.42	348	150	H	32.94	4.91	-	57.27	64	-6.73	Ave
4924	46.81	325	120	H	35.3	9.11	35.707	54.74	84	-29.26	Peak
4924	46.18	345	150	V	35.3	9.11	35.707	54.11	84	-29.89	Ave
4924	35.70	325	120	H	35.3	9.11	35.707	43.63	64	-20.37	Peak
4924	35.05	345	150	V	35.3	9.11	35.707	42.98	64	-21.02	Ave

Note: Measurements made at 1 meter.

802.11n40 mode

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2422 MHz											
2390	30.65	104	233	V	33.10	4.91	-	68.66	84	-15.34	Peak
2390	20.04	104	233	V	33.10	4.91	-	58.05	64	-5.95	Ave
2390	30.65	0	171	H	33.10	4.91	-	68.66	84	-15.34	Peak
2390	18.08	0	171	H	33.10	4.91	-	56.09	64	-7.91	Ave
4844	48.86	48	150	V	35.08	9.11	38.37	54.68	84	-29.32	Peak
4844	36.72	48	150	V	35.08	9.11	38.37	42.54	64	-21.46	Ave
4844	48.78	58	170	H	35.08	9.11	38.37	54.60	84	-29.40	Peak
4844	38.01	58	170	H	35.08	9.11	38.37	43.83	64	-20.17	Ave
Middle Channel 2437 MHz											
4874	48.23	83	150	V	35.06	9.11	38.37	54.03	84	-29.97	Peak
4874	36.15	83	150	V	35.06	9.11	38.37	41.95	64	-22.05	Ave
4874	48.51	4	150	H	35.06	9.11	38.37	54.31	84	-29.69	Peak
4874	36.30	4	150	H	35.06	9.11	38.37	42.10	64	-21.90	Ave
High Channel 2452 MHz											
2483.5	31.45	236	226	V	32.94	4.91	-	69.30	84	-14.70	Peak
2483.5	18.63	236	226	V	32.94	4.91	-	56.48	64	-7.52	Ave
2483.5	32.12	132	196	H	32.94	4.91	-	69.97	84	-14.03	Peak
2483.5	20.14	132	196	H	32.94	4.91	-	57.99	64	-6.01	Ave
4904	48.43	113	127	V	35.06	9.11	38.37	54.23	84	-29.77	Peak
4904	36.72	113	127	V	35.06	9.11	38.37	42.52	64	-21.48	Ave
4904	48.47	44	128	H	35.06	9.11	38.37	54.27	84	-29.73	Peak
4904	36.65	44	128	H	35.06	9.11	38.37	42.45	64	-21.55	Ave

Note: Measurements made at 1 meter.

DH1

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
2390	51.710	43	150	H	32.228	4.913	39.359	49.49	74	-24.51	Peak
2390	50.260	287	150	V	32.228	4.913	39.359	48.04	74	-25.96	Peak
2390	44.763	43	150	H	32.228	4.913	39.359	42.54	54	-11.46	Ave
2390	44.367	287	150	V	32.228	4.913	39.359	42.15	54	-11.85	Ave
4804	48.610	100	150	V	34.70	8.596	38.379	53.53	74	-20.47	Peak
4804	42.703	100	150	V	34.70	8.596	38.379	47.62	54	-6.38	Ave
4804	48.020	63	300	H	34.70	8.596	38.379	52.94	74	-21.06	Peak
4804	42.611	63	300	H	34.70	8.596	38.379	47.53	54	-6.47	Ave
Middle Channel 2440 MHz											
4880	48.100	168	150	V	34.68	8.596	38.379	53.00	74	-21.00	Peak
4880	42.254	168	150	V	34.68	8.596	38.379	47.15	54	-6.85	Ave
4880	48.440	256	150	H	34.68	8.596	38.379	53.34	74	-20.66	Peak
4880	42.740	256	150	H	34.68	8.596	38.379	47.64	54	-6.36	Ave
High Channel 2480 MHz											
2483.5	56.270	153	150	H	32.665	4.913	39.359	54.49	74	-19.51	Peak
2483.5	58.310	78	300	V	32.665	4.913	39.359	56.53	74	-17.47	Peak
2483.5	45.623	153	150	H	32.665	4.913	39.359	43.84	54	-10.16	Ave
2483.5	43.349	78	300	V	32.665	4.913	39.359	41.57	54	-12.43	Ave
4960	48.620	360	100	V	34.68	8.596	38.379	53.52	74	-20.49	Peak
4960	42.525	360	100	V	34.68	8.596	38.379	47.42	54	-6.58	Ave
4960	48.580	283	190	H	34.68	8.596	38.379	53.48	74	-20.53	Peak
4960	42.558	283	190	H	34.68	8.596	38.379	47.45	54	-6.55	Ave

Note: Measurements made at 3 meters.

2DH1

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
2390	50.620	174	150	H	32.228	4.913	39.359	48.40	74	-25.60	Peak
2390	49.950	138	150	V	32.228	4.913	39.359	47.73	74	-26.27	Peak
2390	43.771	174	150	H	32.228	4.913	39.359	41.55	54	-12.45	Ave
2390	44.051	138	150	V	32.228	4.913	39.359	41.83	54	-12.17	Ave
4804	48.370	310	300	V	34.70	8.596	38.379	53.29	74	-20.71	Peak
4804	42.308	310	300	V	34.70	8.596	38.379	47.23	54	-6.77	Ave
4804	48.830	65	150	H	34.70	8.596	38.379	53.75	74	-20.25	Peak
4804	42.926	65	150	H	34.70	8.596	38.379	47.85	54	-6.15	Ave
Middle Channel 2440 MHz											
4880	48.370	135	150	V	34.68	8.596	38.379	53.27	74	-20.73	Peak
4880	42.471	135	150	V	34.68	8.596	38.379	47.37	54	-6.63	Ave
4880	48.480	200	260	H	34.68	8.596	38.379	53.38	74	-20.62	Peak
4880	42.343	200	260	H	34.68	8.596	38.379	47.24	54	-6.76	Ave
High Channel 2480 MHz											
2483.5	56.510	56	150	H	32.665	4.913	39.359	54.73	74	-19.27	Peak
2483.5	54.950	103	261	V	32.665	4.913	39.359	53.17	74	-20.83	Peak
2483.5	44.675	56	150	H	32.665	4.913	39.359	42.89	54	-11.11	Ave
2483.5	43.933	103	261	V	32.665	4.913	39.359	42.15	54	-11.85	Ave
4960	47.600	310	150	V	34.68	8.596	38.379	52.50	74	-21.51	Peak
4960	42.426	310	150	V	34.68	8.596	38.379	47.32	54	-6.68	Ave
4960	49.150	0	215	H	34.68	8.596	38.379	54.05	74	-19.96	Peak
4960	44.275	0	215	H	34.68	8.596	38.379	49.17	54	-4.83	Ave

Note: Measurements made at 3 meters.

3DH1

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
2390	50.280	0	150	H	32.228	4.913	39.359	48.06	74	-25.94	Peak
2390	50.610	140	203	V	32.228	4.913	39.359	48.39	74	-25.61	Peak
2390	44.640	0	150	H	32.228	4.913	39.359	42.42	54	-11.58	Ave
2390	42.807	140	203	V	32.228	4.913	39.359	40.59	54	-13.41	Ave
4804	48.270	360	150	V	34.70	8.596	38.379	53.19	74	-20.81	Peak
4804	42.932	360	150	V	34.70	8.596	38.379	47.85	54	-6.15	Ave
4804	49.050	24	255	H	34.70	8.596	38.379	53.97	74	-20.03	Peak
4804	42.986	24	255	H	34.70	8.596	38.379	47.91	54	-6.09	Ave
Middle Channel 2440 MHz											
4880	48.520	0	128	V	34.68	8.596	38.379	53.42	74	-20.58	Peak
4880	42.797	0	128	V	34.68	8.596	38.379	47.70	54	-6.30	Ave
4880	47.980	319	150	H	34.68	8.596	38.379	52.88	74	-21.12	Peak
4880	42.529	319	150	H	34.68	8.596	38.379	47.43	54	-6.57	Ave
High Channel 2480 MHz											
2483.5	58.540	0	150	H	32.665	4.913	39.359	56.76	74	-17.24	Peak
2483.5	54.520	124	270	V	32.665	4.913	39.359	52.74	74	-21.26	Peak
2483.5	43.804	0	150	H	32.665	4.913	39.359	42.02	54	-11.98	Ave
2483.5	44.131	124	270	V	32.665	4.913	39.359	42.35	54	-11.65	Ave
4960	47.950	290	150	V	34.68	8.596	38.379	52.85	74	-21.15	Peak
4960	42.853	290	150	V	34.68	8.596	38.379	47.75	54	-6.25	Ave
4960	49.160	152	150	H	34.68	8.596	38.379	54.06	74	-19.94	Peak
4960	41.787	152	150	H	34.68	8.596	38.379	46.69	54	-7.31	Ave

Note: Measurements made at 3 meters.

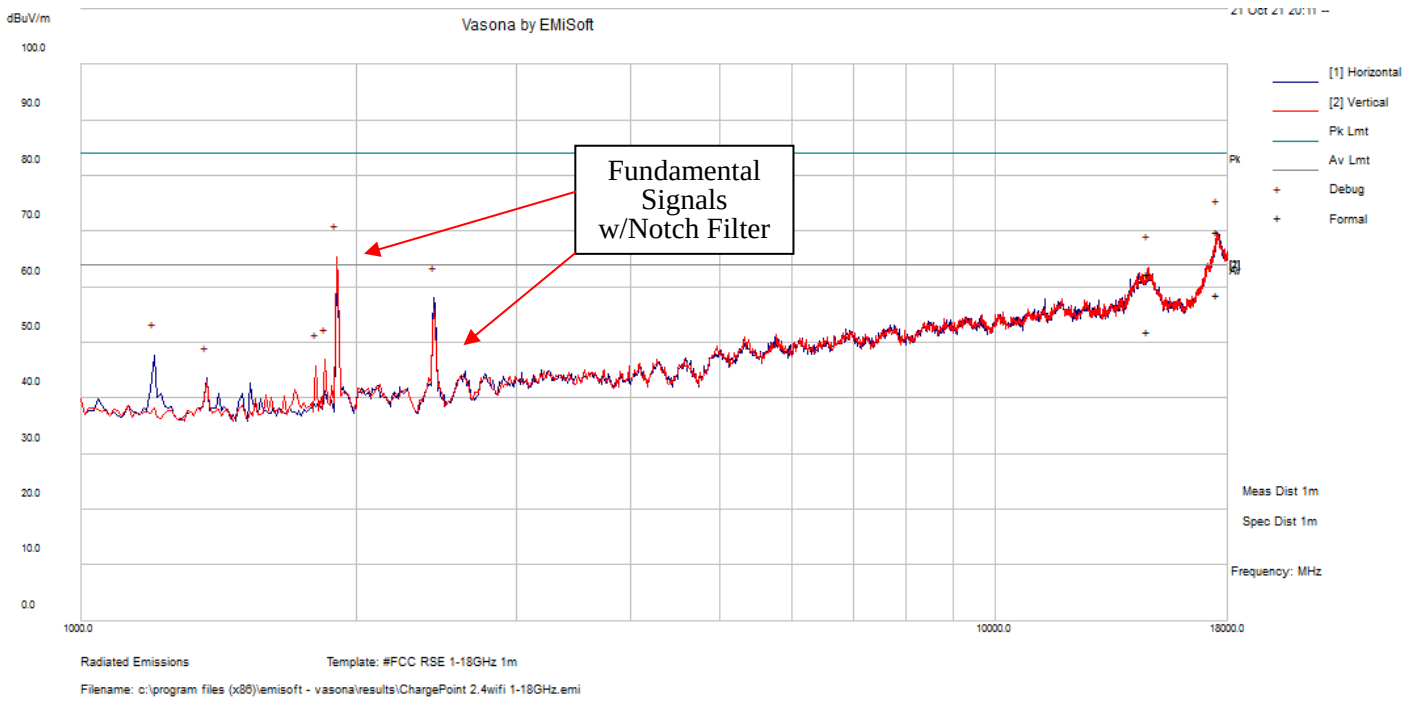
BLE

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna			Cable Loss (dB)	Pre-Amp. (dB)	Cord. Reading (dBµV/m)	FCC/IC		Comments
			Height (cm)	Polarity (H/V)	Factor (dB/m)				Limit (dBµV/m)	Margin (dB)	
Low Channel 2402 MHz											
2390	49.460	0	150	H	32.228	4.913	39.359	47.24	74	-26.76	Peak
2390	50.130	0	150	V	32.228	4.913	39.359	47.91	74	-26.09	Peak
2390	39.961	0	150	H	32.228	4.913	39.359	37.74	54	-16.26	Ave
2390	40.762	0	150	V	32.228	4.913	39.359	38.54	54	-15.46	Ave
4804	50.550	287	115	V	34.70	8.596	38.379	55.47	74	-18.53	Peak
4804	37.030	287	115	V	34.70	8.596	38.379	41.95	54	-12.05	Ave
4804	49.390	185	150	H	34.70	8.596	38.379	54.31	74	-19.69	Peak
4804	37.058	185	150	H	34.70	8.596	38.379	41.98	54	-12.02	Ave
Middle Channel 2440 MHz											
4880	48.930	0	150	V	34.68	8.596	38.379	53.83	74	-20.17	Peak
4880	38.045	0	150	V	34.68	8.596	38.379	42.94	54	-11.06	Ave
4880	48.640	251	140	H	34.68	8.596	38.379	53.54	74	-20.46	Peak
4880	36.947	251	140	H	34.68	8.596	38.379	41.85	54	-12.15	Ave
High Channel 2480 MHz											
2483.5	54.160	133	129	H	32.665	4.913	39.359	52.38	74	-21.62	Peak
2483.5	54.750	100	300	V	32.665	4.913	39.359	52.97	74	-21.03	Peak
2483.5	39.523	133	129	H	32.665	4.913	39.359	37.74	54	-16.26	Ave
2483.5	40.599	100	300	V	32.665	4.913	39.359	38.82	54	-15.18	Ave
4960	48.950	72	150	V	34.68	8.596	38.379	53.85	74	-20.16	Peak
4960	37.992	72	150	V	34.68	8.596	38.379	42.89	54	-11.11	Ave
4960	48.470	360	150	H	34.68	8.596	38.379	53.37	74	-20.64	Peak
4960	37.984	360	150	H	34.68	8.596	38.379	42.88	54	-11.12	Ave

Note: Measurements made at 3 meters.

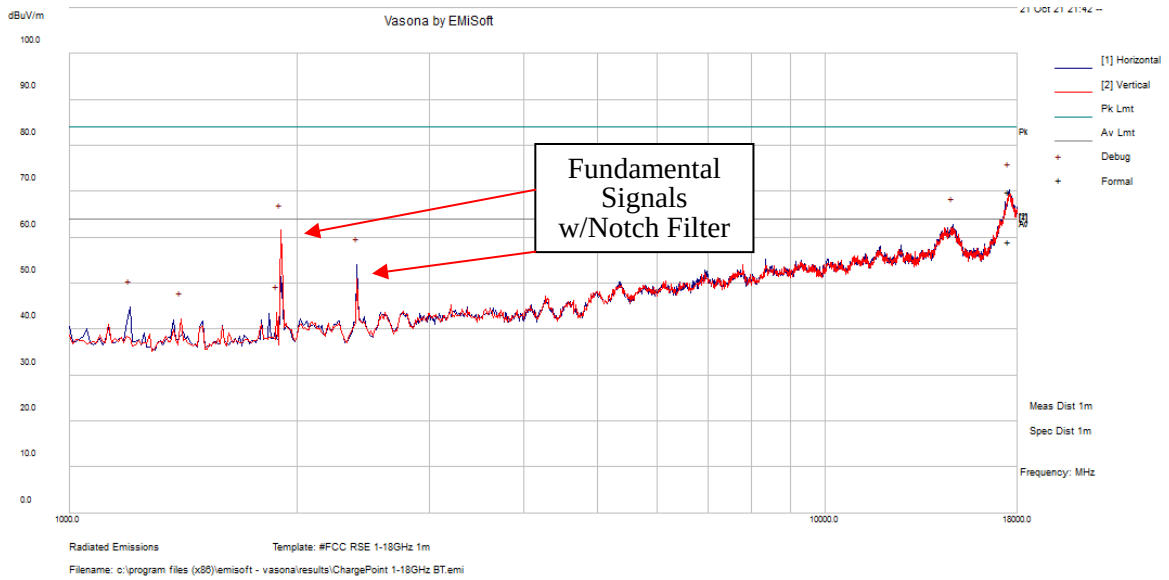
4) 1 GHz – 18 GHz Worst Case Scan at 1 Meter

Worst Case: 2.4GHz Wifi (g mode, 2437 MHz) + Cellular Modem (WCDMA Band II) + RFID



Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
17533.105	44.41	25.43	69.84	212	V	266	84	-14.16	Peak
17533.105	33.26	25.43	58.69	212	V	266	64	-5.31	Average

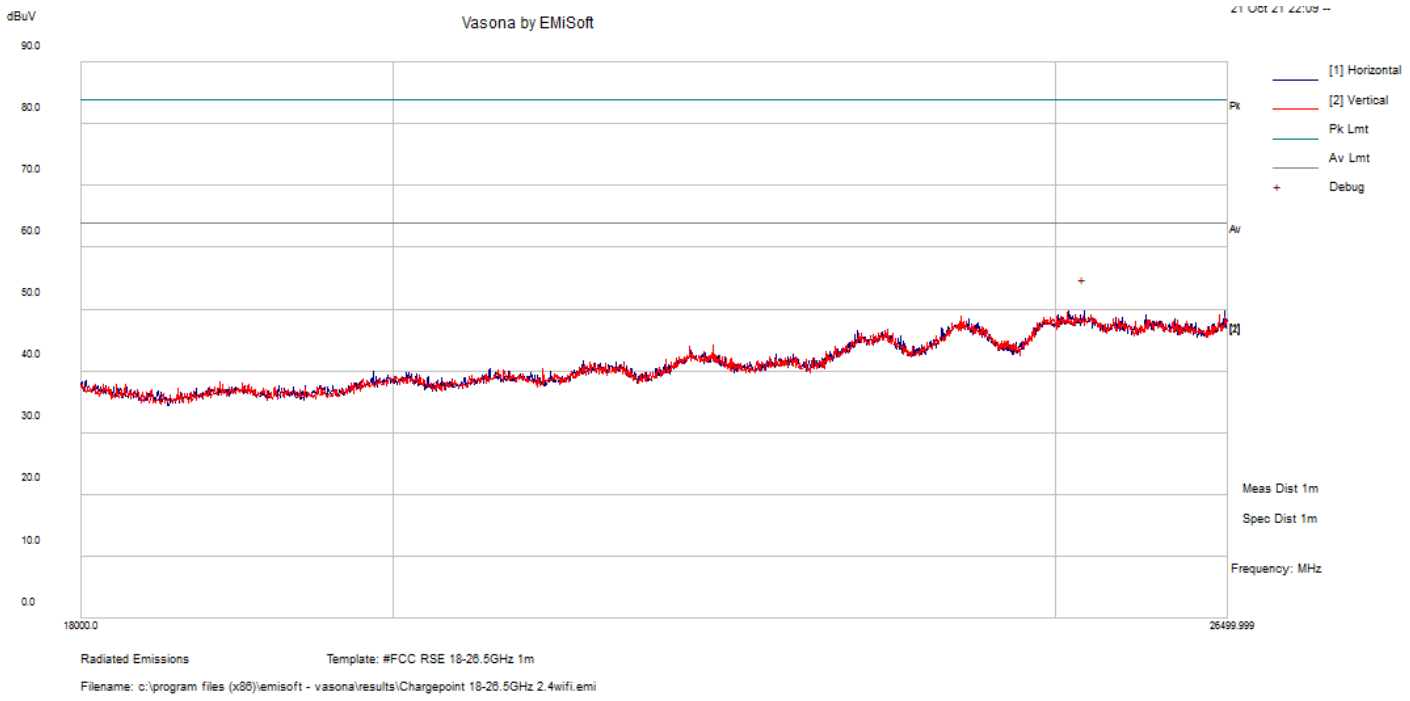
Worst Case: BT (DH1, 2402 MHz) + Cellular Modem (WCDMA Band II) + RFID



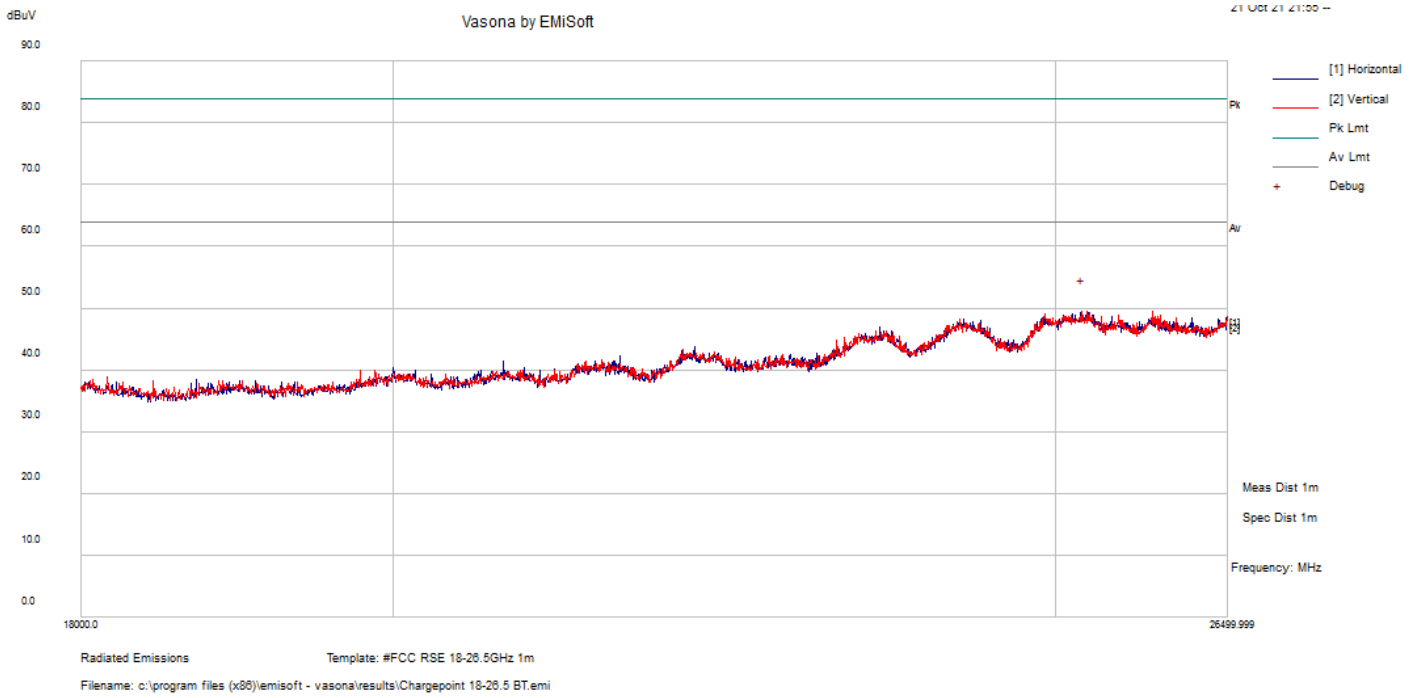
Frequency (MHz)	S.A. Reading (dBµV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Comment
17544.413	44.33	25.52	69.85	180	H	72	84	-14.15	Peak
17544.413	33.52	25.51	59.03	180	H	72	64	-4.97	Average

5) 18 GHz – 26.5 GHz Worst Case Scan at 1 Meter

Worst Case: 2.4GHz Wifi (g mode, 2437 MHz) + Cellular Modem (WCDMA Band II) + RFID



Worst Case: BT (DH1, 2402 MHz) + Cellular Modem (WCDMA Band II) + RFID



7 Annex A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

8 Annex B (Normative) – EUT Photographs

Please refer to the attachment.

9 Annex C (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 10th day of March 2021.

Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2022

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 ---