FCC PART 15, SUBPART C
ISEDC RSS-247, ISSUE 3, AUGUST 2023

TEST REPORT

For

Zebra Technologies Corporations

3 Overlook Point
Lincolnshire, IL 60069, USA

FCC ID: UZ7RE40
IC: 109AN-RE40

Report Type: FCC: Class II Permissive Change IC: Class IV Permissive Change	**Product Type:** RFID Module
Prepared By:	Arturo Reyes, Test Engineer
Report Number:	R2311293-247
Report Date:	2024-08-08
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ACCREDITED
CERTIFICATE #3297.02

* 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	R2311293-247	Permissive Change	2024-08-08

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report is prepared on behalf of *Zebra Technologies Corporations*, and their product model: ZQ630, FCC ID: UZ7RE40, IC: 109AN-RE40, the "EUT" as referred to in this report. The EUT is an RFID module. It will be able to collocate with two radios separately that support Bluetooth, and 2.4/5 GHz Wi-Fi capabilities ac-module (FCC IC: I28MD- FXLAN11AC, IC: 3798B-FXLAN11AC) and ax-module (FCC ID: I28-WYSBHVDXP, IC: 3798B- WYSBHVDXP). For testing purposes, module was installed in host device model number ZQ630.

Model Number	RE40
FCC ID	UZ7RE40
IC	109AN-RE40
Radio Type	RFID
Operating Frequency	902.75 – 927.25 MHz
Modulation	ASK
Channel Spacing	200 kHz
Maximum Conducted Output Power	27.22 dBm
Antenna Gain	-30 dBi

1.2 Mechanical Description of EUT

The UUT measures approximately 26.0 cm (L) x 12.0 cm (W) x 17.0 cm (H) and weighs approximately 2.1 kg.

The data gathered was from a production sample provided by Zebra Technologies Corporations with S/N: XXZVN234500334 (FXLAN11AC) and XXZVN234600616 (WYSBHVDXP).

1.3 Objective

This report is prepared on behalf of *Zebra Technologies Corporations* in accordance with Part 2, Subpart J, and Part 15, Subpart C of the Federal Communication Commission's rules and ISEDC RSS-247 Issue 3, August 2023.

The objective is to determine compliance with FCC Part 15.247 and ISEDC RSS-247 for Radiated Spurious Emissions with the radio module collocating with additional modules for portable use.

In order to determine compliance, the manufacturer or a contracted laboratory makes measurements and takes the necessary steps to ensure that the equipment complies with the appropriate technical standards.

Maintenance of compliance is the responsibility of the manufacturer. Any modification of the product maybe which result in lowering the immunity should be checked to ensure compliance has been maintained (i.e., printed circuit board layout changes, different line filter, different power supply, harnessing and/or I/O cable changes, etc.).

1.4 Related Submittal(s)/Grant(s)

N/A

1.5 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

1.6 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 %

1.7 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.

1.8 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2017 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

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

2.2 EUT Exercise Software

The exercising software used during testing was "Toolboxv1.83", provided by Zebra Technologies Corporations. The software is compliant with the standard requirements being tested against.

Radio	Config	Frequency (MHz)	Power Setting
RFID	-	915.2	Default
AX/AC Modules	BTC DH1	2402	Default
	2.4Wifi 802.11b	2437	Default
	5Wifi 802.11a	5180	Default

2.3 Equipment Modification

No modifications were made to the EUT during testing.

2.4 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Dell	Laptop	Latitude E6410	[Serial Number]

2.5 Remote Support Equipment

N/A

2.6 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Zebra Technologies Corporation	FSP025-DYAA3	P1186006	H00000311

2.7 Interface Ports and Cabling

Cable Description	Length (m)	From	To
USB Cable	1.5	Laptop	EUT

3 Summary of Test Results

FCC & ISEDC Rules	Description of Test	Results
FCC §2.1093, §15.247(i) ISED RSS-102	RF Exposure	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

BACL is responsible for all the information provided in this report, except when information is provided by the customer as identified in this report. Information provided by the customer, e.g., antenna gain, can affect the validity of results.

4 FCC §15.247(i) §2.1093 & ISED RSS-102 - RF Exposure

4.1 Applicable Standards

The Report and Order requires routine SAR evaluation prior to equipment authorization of portable transmitter devices, including portable telephones. SAR limits are listed in the table below. The regulatory limits referenced are:

FCC:
Title 47 (85 FR 18145, Apr. 1, 2020) § 1.1310 (b), (c), (d)

IC:
RSS-102 Issue 6 (December 15 2023) § 5.2.2

The limit below which the exposure to RF is considered safe by regulatory bodies in North America is 1.6 W/kg average over 1 gram of tissue mass.

EXPOSURE LIMITS	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / Controlled Exposure Environment)
Spatial Average (averaged over the whole body)	0.08	0.4
Spatial Peak FCC/IC (averaged over any 1 g of tissue)	1.6	8.0
Spatial Peak (hands/wrists/feet/ankles averaged over 10 g)	4.0	20.0

General Population/Uncontrolled Environments are defined as locations where there is the exposure of individual who have no knowledge or control of their exposure.

General Population/Uncontrolled environments Spatial Peak limit 1.6 W/kg (FCC/IC over 1 g) applied to the EUT in this application for the worst case consideration.

4.2 RF exposure evaluation exemption

AC Module (Per Report No: FCC-IC_SAR_SL18100302-ZBR-057 Rev_1.0 from FCC ID: I28MD-FXLAN11AC certification dated 2/22/19):
900 MHz RFID(Per Report No: R2311293-SAR):

BT/2.4 Wi-Fi + 900MHz RFID colocation:

0.0766/1.6 (worst case BT/2.4Wifi contribution) + 0/1.6 (900MHz RFID contribution) = 0.048 < 1

5 Wi-Fi + 900MHz RFID colocation:

0.1531/1.6 (worst case 5GHzWifi contribution) + 0/1.6 (900MHz RFID contribution) = 0.096 < 1

AX Module (Per Report No: FA0D2423-06 from FCC ID: I28-WYSBHVDXP certification dated 10/26/23):
900 MHz RFID (Per Report No: R2311293-SAR):

BT/2.4 Wi-Fi+ 900MHz RFID colocation:

0.62/1.6 (worst case BT/2.4Wifi contribution) + 0/1.6 (900MHz RFID contribution) = 0.39 < 1

5 Wi-Fi + 900MHz RFID colocation:

0.49/1.6 (worst case 5GHzWifi contribution) + 0/1.6 (900MHz RFID contribution) = 0.31 < 1

4 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

4.1 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	16.42 – 16.423	960 – 1240	4. 5 – 5. 15
0.495 – 0.505	16.69475 – 16.69525	1300 – 1427	5. 35 – 5. 46
2.1735 – 2.1905	25.5 – 25.67	1435 – 1626.5	7.25 – 7.75
4.125 – 4.128	37.5 – 38.25	1645.5 – 1646.5	8.025 – 8.5
4.17725 – 4.17775	73 – 74.6	1660 – 1710	9.0 – 9.2
4.20725 – 4.20775	74.8 – 75.2	1718.8 – 1722.2	9.3 – 9.5
6.215 – 6.218	108 – 121.94	2200 – 2300	10.6 – 12.7
6.26775 – 6.26825	123 – 138	2310 – 2390	13.25 – 13.4
6.31175 – 6.31225	149.9 – 150.05	2483.5 – 2500	14.47 – 14.5
8.291 – 8.294	156.52475 – 156.52525	2690 – 2900	15.35 – 16.2
8.362 – 8.366	156.7 – 156.9	3260 – 3267	17.7 – 21.4
8.37625 – 8.38675	162.0125 –167.17	3.332 – 3.339	22.01 – 23.12
8.41425 – 8.41475	167.72 – 173.2	3 3458 – 3 358	23.6 – 24.0
12.29 – 12.293	240 – 285	3.600 – 4.400	31.2 – 31.8
12.51975 – 12.52025	322 – 335.4		36.43 – 36.5
12.57675 – 12.57725	399.9 – 410		Above 38.6
13.36 – 13.41	608 – 614		

As per FCC §15.209(a): Except as provided elsewhere in this Subpart, the emissions from an intentional radiator shall not exceed the field strength levels specified in the following table

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

** Except as provided in paragraph (g), fundamental emissions from intentional radiators operating under this Section shall not be located in the frequency bands 54-72 MHz, 76-88 MHz, 174-216 MHz or 470-806 MHz. However, operation within these frequency bands is permitted under other sections of this Part, e.g., Sections 15.231 and 15.241.

As per FCC §15.247 (d),

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

As per 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.

As per ISEDC RSS-Gen §8.9,

Except where otherwise indicated in the applicable RSS, radiated emissions shall comply with the field strength limits shown in table 5 and table 6. Additionally, the level of any transmitter unwanted emission shall not exceed the level of the transmitter's fundamental emission.

Table 5 – General field strength limits at frequencies above 30 MHz

Frequency (MHz)	Field Strength (µV/m at 3 m)
30 – 88	100
88 – 216	150
216 – 960	200
Above 960	500

Table 6 – General field strength limits at frequencies below 30 MHz

Frequency	Field Strength (micro volts/meter)	Measurement Distance (meters)
9 – 490 kHz[Note 1]	6.37/F (F in kHz)	300
490 – 1705 kHz	63.7/F (F in kHz)	30
1.705 – 30 MHz	0.08	30

Note 1: The emission limits for the ranges 9-90 kHz and 110-490 kHz are based on measurements employing a linear average detector.

As per ISEDC RSS-Gen §8.10(c),

Unwanted emissions that do not fall within the restricted frequency bands listed in table 7 shall comply either with the limits specified in the applicable RSS or with those specified in table 5 and table 6.

Table 7 – Restricted frequency bands[Note 1]

MHz	MHz	GHz
0.090 – 0.110	149.9 – 150.05	9.0 – 9.2
0.495 – 0.505	156.52475 – 156.52525	9.3 – 9.5
2.1735 – 2.1905	156.7 – 156.9	10.6 – 12.7
3.020 – 3.026	162.0125 –167.17	13.25 – 13.4
4.125 – 4.128	167.72 – 173.2	14.47 – 14.5
4.17725 – 4.17775	240 – 285	15.35 – 16.2
4.20725 – 4.20775	322 – 335.4	17.7 – 21.4
5.677 – 5.683	399.9 – 410	22.01 – 23.12
6.215 – 6.218	608 – 614	23.6 – 24.0
6.26775 – 6.26825	960 – 1427	31.2 – 31.8
6.31175 – 6.31225	1435 – 1626.5	36.43 – 36.5
8.291 – 8.294	1645.5 – 1646.5	Above 38.6
8.362 – 8.366	1660 – 1710	
8.37625 – 8.38675	1718.8 – 1722.2	
8.41425 – 8.41475	2200 – 2300	
12.29 – 12.293	2310 – 2390	
12.51975 – 12.52025	2483.5 – 2500	
12.57675 – 12.57725	2655 – 2900	
13.36 – 13.41	3260 – 3267	
16.42 – 16.423	3332 – 3339	
16.69475 – 16.69525	3345.8 – 3358	
16.80425 – 16.80475	3500 – 4400	
25.5 – 25.67	4500 – 5150	
37.5 – 38.25	5350 – 5460	
73 – 74.6	7250 – 7750	
74.8 – 75.2	8025 – 8500	
108 – 138		

Note 1: Certain frequency bands listed in table 7 and in bands above 38.6 GHz are designated for licence-exempt applications. These frequency bands and the requirements that apply to related devices are set out in the 200 and 300 series of RSSs.

4.2 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 §15.247 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 bundled when necessary.

4.3 Test Procedure

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

4.4 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

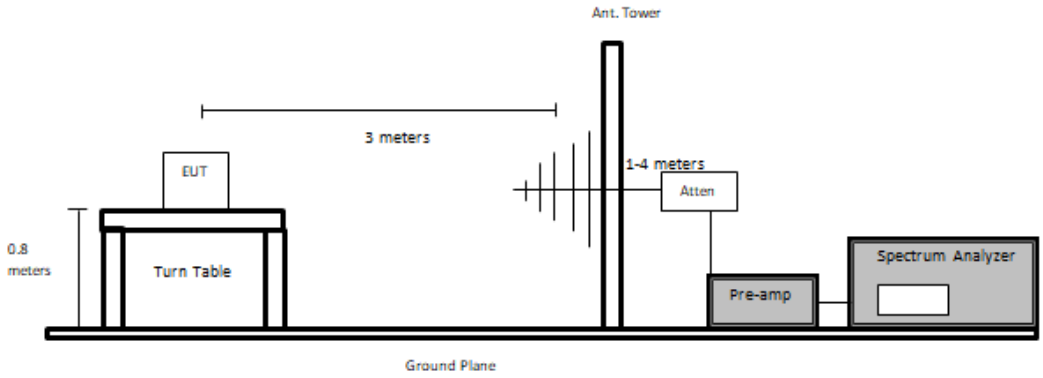
For example, a corrected amplitude of 40.3 dBuV/m = Indicated Reading (32.5 dBuV) + Antenna Factor (+23.5dB) + Cable Loss (3.7 dB) + Attenuator (10 dB) - Amplifier Gain (29.4 dB)

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:

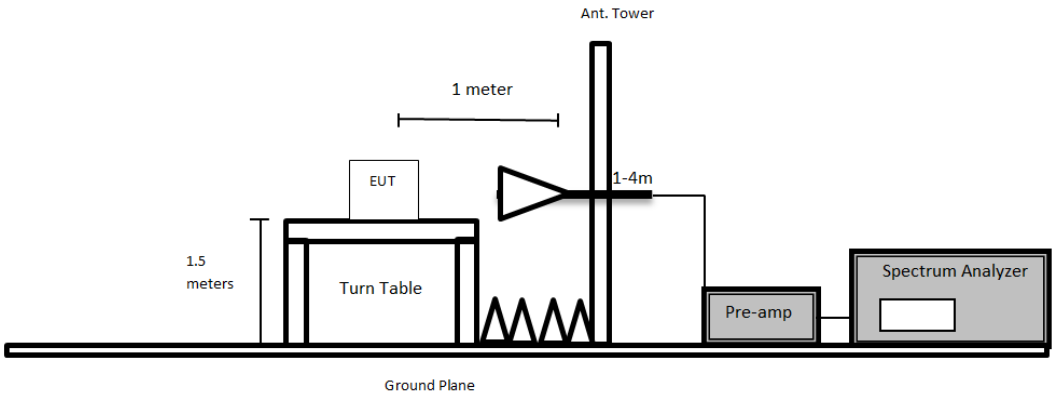
Margin = Corrected Amplitude – Limit

4.5 Test Setup Block Diagram

Below 1 GHz



Above 1 GHz



4.6 Test Equipment List and Details

BACL No	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
310	Rohde & Schwarz	EMI test receiver 9 KHZ to 3 GHZ	ESCI 1166.5950.03	100338	2023-05-11	15 months
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2024-02-27	6 months
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2023-12-18	2 years
1186	Pasternack	Coaxial Cable, RG214	PE3062-1050CM	-	2023-10-03	10 months
1245	-	6dB Attenuator	PE7390-6	01182018A	2023-12-18	2 years
1246	Hewlet Packard	RF Limiter	11867A	01734	2023-04-13	16 months
1248	Pasternack	RG214 COAX Cable	PE3062	-	2023-10-04	10 months
1249	Time microwave	LMR-400 Cable Dc-3 GHz	AE13684	2k80612-5 6fts	2023-10-09	10 months
624	Agilent	Spectrum Analyzer	E4446A	MY48250238	2023-05-12	1 year
658	HP/ Agilant	Preamplifier	8449B OPT HO2	3008A01103	2023-12-01	6 months
827	AH Systems	Preamplifier	PAM 1840 VH	170	2023-11-08	6 months
90	Wisewave	Horn Antenna	ARH-4223-02	10555-01	2023-05-02	2 years
92	Wisewave	Horn Antena	ARH-2823-02	10555-01	2022-03-17	2 years
1192	ETS Lindgren	Horn Antenna	3117	00218973	2022-09-29	2 years
1247	Uti flex	Micro - Coax	-	-	2023-12-01	6 months
1329	Pasternack	2.92mm short coaxial cable	PE360-12	-	2023-11-28	6 months
1353	RFMW	2.92mm 10ft RF Cable DC to 40 GHz	P1CA-29M29M-F150-120	-	2024-01-24	1 year
672	Micro-Tronics	2.4-2.6 GHz Notch Filter	BRM50701	160	2023-03-09	13 months
387	Micro-Tronics	5150-5350 MHz Notch Filter	BRC50703	006	2023-03-02	13 months
389	Micro-Tronics	5.6 GHz Notch Filter	BRC 50704	003	2023-05-04	1 year
327	Sunol Sciences	System Controller	SC110V	122303-1	NR	NR
1075	Sunol Sciences	Boresight Tower	TLT3	050119-7	NR	NR
1388	Sunol Sciences	Flush Mount Turntable	FM	112005-2	NR	NR

Note[1]: cables, attenuators and notch filters included in the test set-up were 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".*

4.7 Test Environmental Conditions

Temperature:	20.5 - 22 ºC
Relative Humidity:	52 - 55 %
ATM Pressure:	108.5 kPa

The testing was performed by Arturo Reyes from 2024-02-28 to 2024-03-21, and on 2024-07-17; and by Will Hu from 2024-03-20 to 2024-03-21, in 5m chamber 3.

4.8 Summary of Test Results

According to the data hereinafter, the EUT complied with the FCC Part 15.209, 15.247 and ISEDC RSS-247 standards' radiated emissions limits, and had the worst margin of:

Worst Case – Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization (Horizontal/Vertical)**	**Configuration**
-0.47	371.303	Horizontal	RFID + 5180Mhz, 802.11a (AX)
-0.59	485.13525	Horizontal	RFID + 2402MHz, BTC DH1 (AC)

Please refer to the tables and plots in the next section for detailed test results.

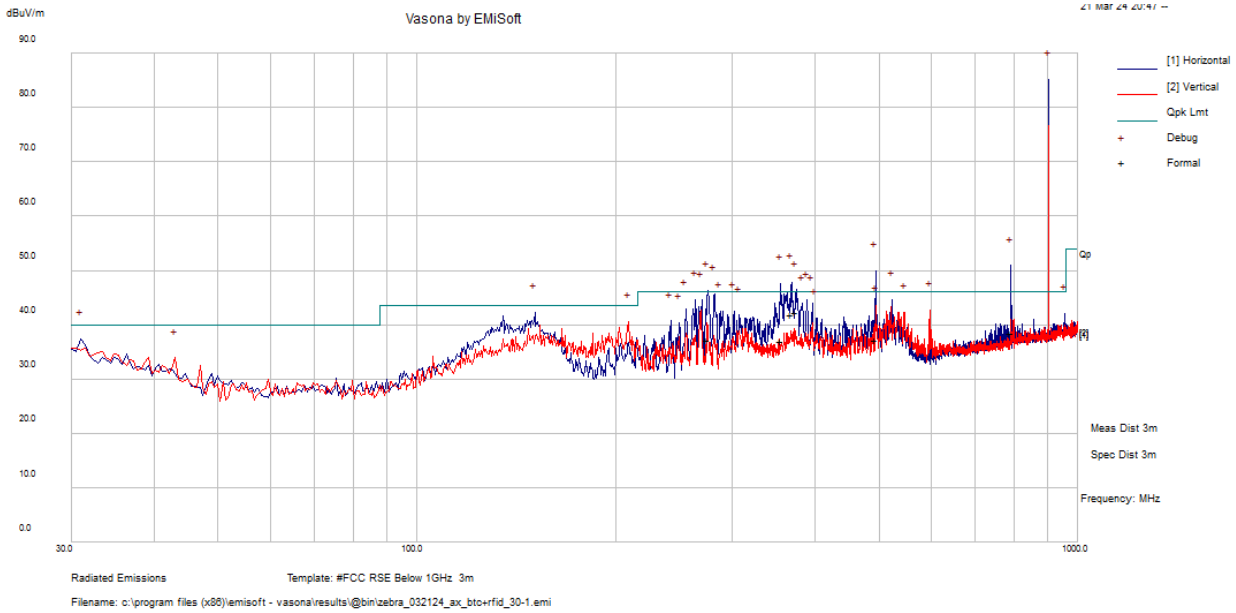
NOTE: AX refers to WLAN radio model: WYSBHVDXP.
NOTE: AC refers to WLAN radio model: FXLAN11AC.

4.9 Radiated Emissions Test Results

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

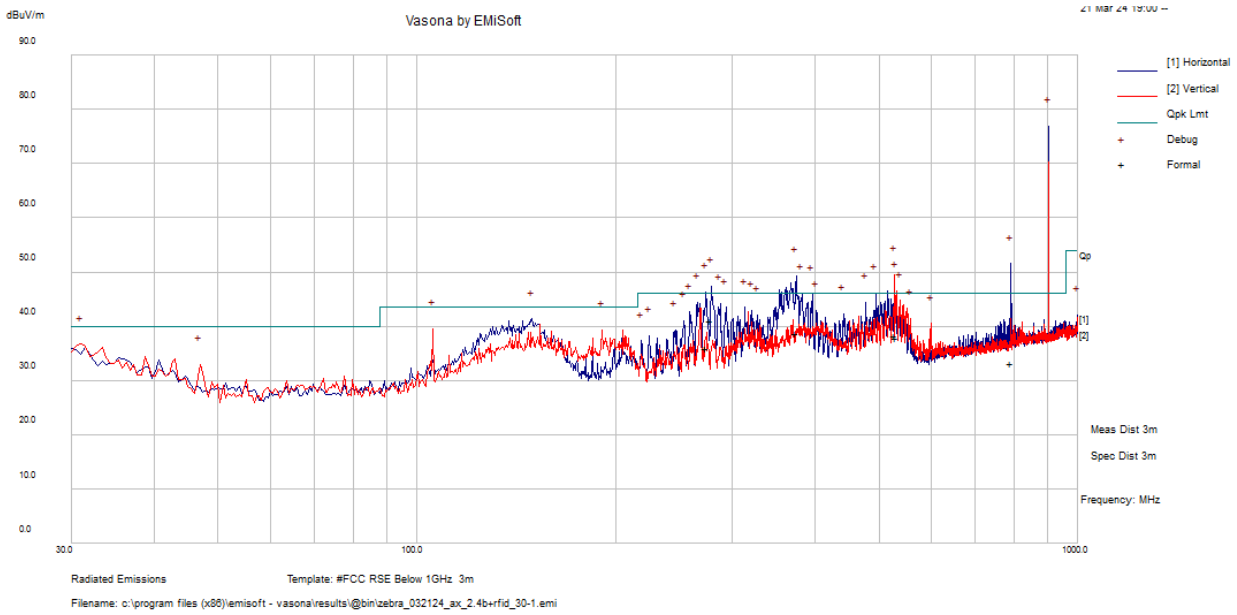
Note: *Pre-scans were performed on all shown configurations in order to determine worst-case results. Following this, a formal scan was performed on the worst-case detailed below*

AX + RE40
BTC: 2402 MHz + RFID: 902.75 MHz



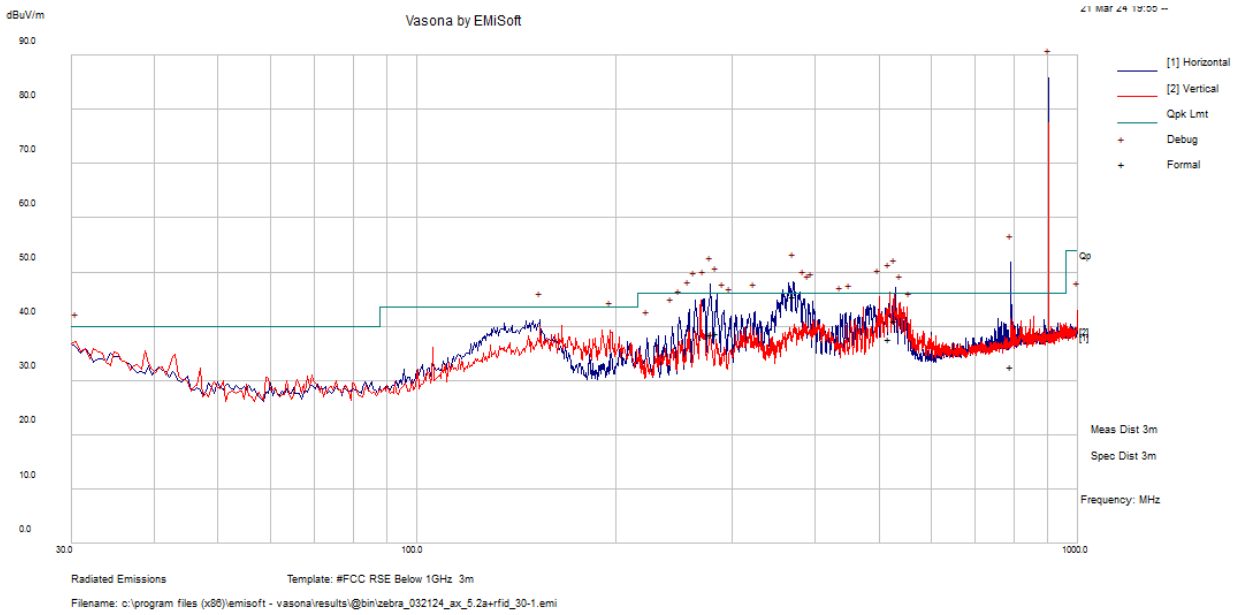
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
792.17075	35.77	2.79	38.56	105	H	66	46	-7.44	QP
493.96825	38.59	-1.45	37.14	181	H	233	46	-8.86	QP
368.875	46.48	-4.68	41.8	109	H	297	46	-4.2	QP
355.216	42.21	-5.11	37.1	120	H	246	46	-8.9	QP
374.586	47.09	-4.73	42.36	101	H	296	46	-3.64	QP
275.224	44.14	-6.93	37.21	122	H	84	46	-8.79	QP

AX + RE40
802.11b: 2437 MHz + RFID: 902.75 MHz



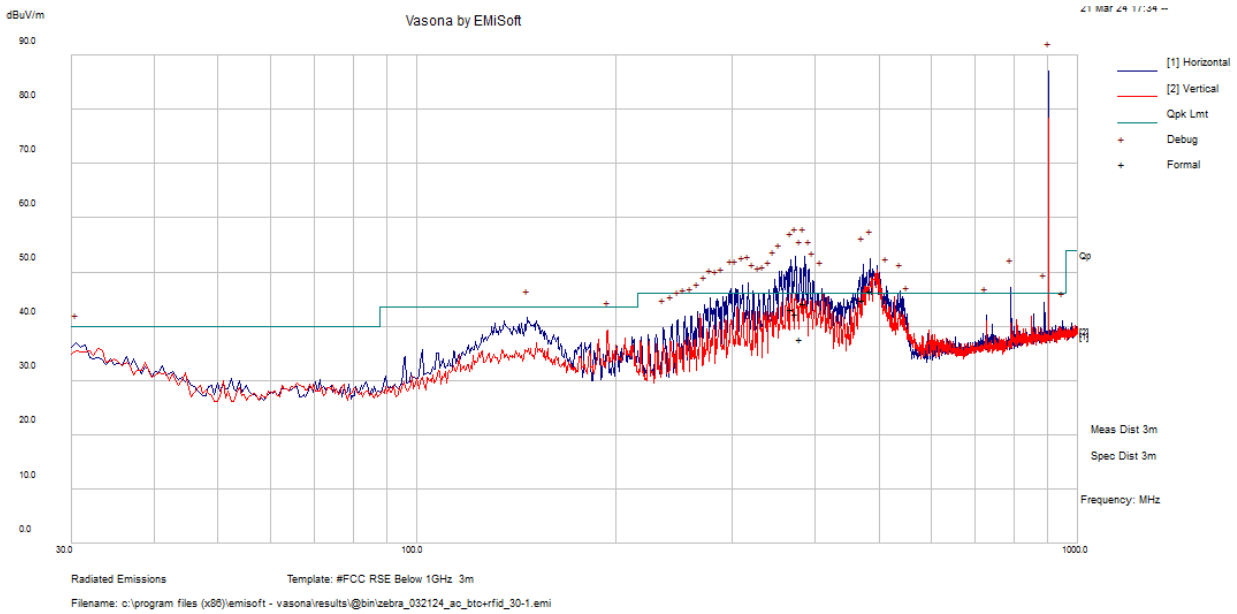
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
792.19325	30.4	2.79	33.19	165	H	7	46	-12.81	QP
528.5435	39.19	-0.97	38.22	127	V	135	46	-7.78	QP
374.938	43.34	-4.73	38.61	113	H	150	46	-7.39	QP
278.66	47.88	-6.86	41.02	118	H	129	46	-4.98	QP
531.55275	38.82	-0.92	37.9	123	V	191	46	-8.1	QP
273.289	42.92	-7	35.92	130	H	125	46	-10.08	QP

AX + RE40
802.11a: 5180 MHz + RFID: 902.75 MHz



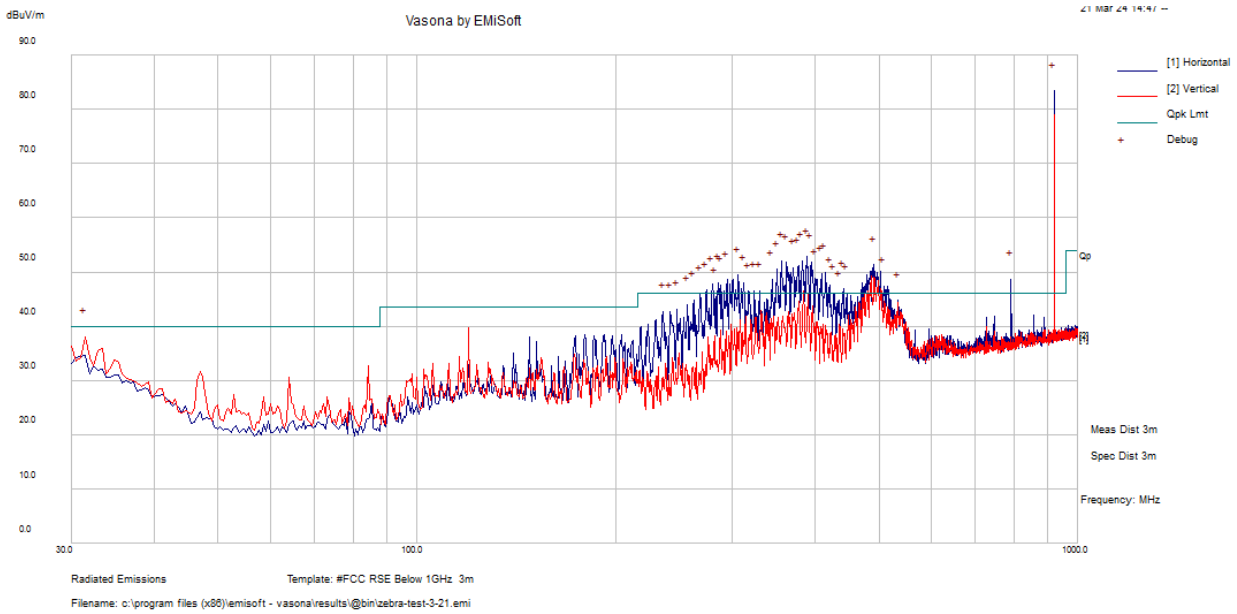
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
792.1725	29.85	2.79	32.64	231	H	17	46	-13.36	QP
371.303	50.23	-4.7	45.53	100	H	294	46	-0.47	QP
278.4475	45.42	-6.86	38.56	126	H	81	46	-7.44	QP
528.911	41.91	-0.95	40.96	144	H	150	46	-5.04	QP
518.933	38.74	-1.18	37.56	109	V	135	46	-8.44	QP
284.014	45.46	-6.75	38.71	134	H	115	46	-7.29	QP

AC + RE40
BTC: 2402 MHz + RFID: 902.25 MHz



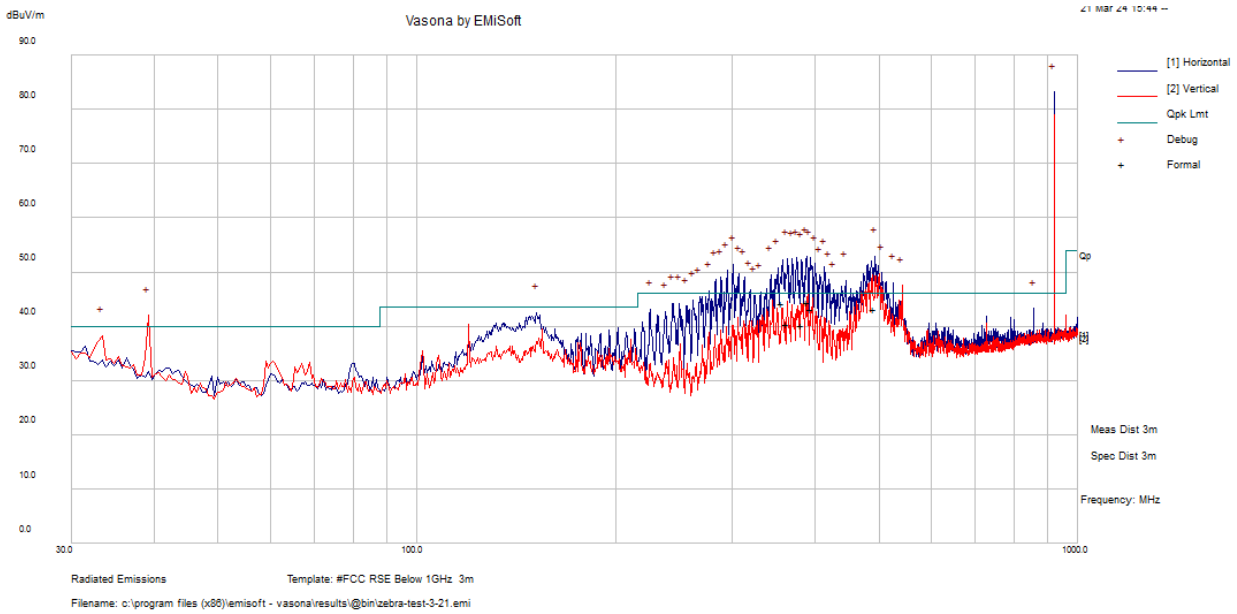
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
385.506	48.86	-4.66	44.2	115	H	283	46	-1.8	QP
374.0205	47	-4.73	42.27	102	H	41	46	-3.73	QP
485.13525	46.87	-1.46	45.41	161	H	327	46	-0.59	QP
368.34175	47.76	-4.67	43.09	114	H	264	46	-2.91	QP
472.6765	46.23	-1.43	44.8	169	H	318	46	-1.2	QP
380.33775	42.47	-4.75	37.72	234	H	70	46	-8.28	QP

AC + RE40
802.11b: 2437 MHz + RFID: 915.75 MHz



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)	Detector
389.06975	49	-4.56	44.44	255	H	49	46	-1.56	QP
356.434	49.35	-5.02	44.33	100	H	96	46	-1.67	QP
382.466	44.86	-4.72	40.14	117	H	110	46	-5.86	QP
394.54625	47.67	-4.4	43.27	269	H	46	46	-2.73	QP
362.27175	45.06	-4.71	40.35	126	H	125	46	-5.65	QP
491.96825	44.69	-1.46	43.23	194	H	334	46	-2.77	QP

AC + RE40
802.11a: 5180 MHz + RFID: 902.75 MHz



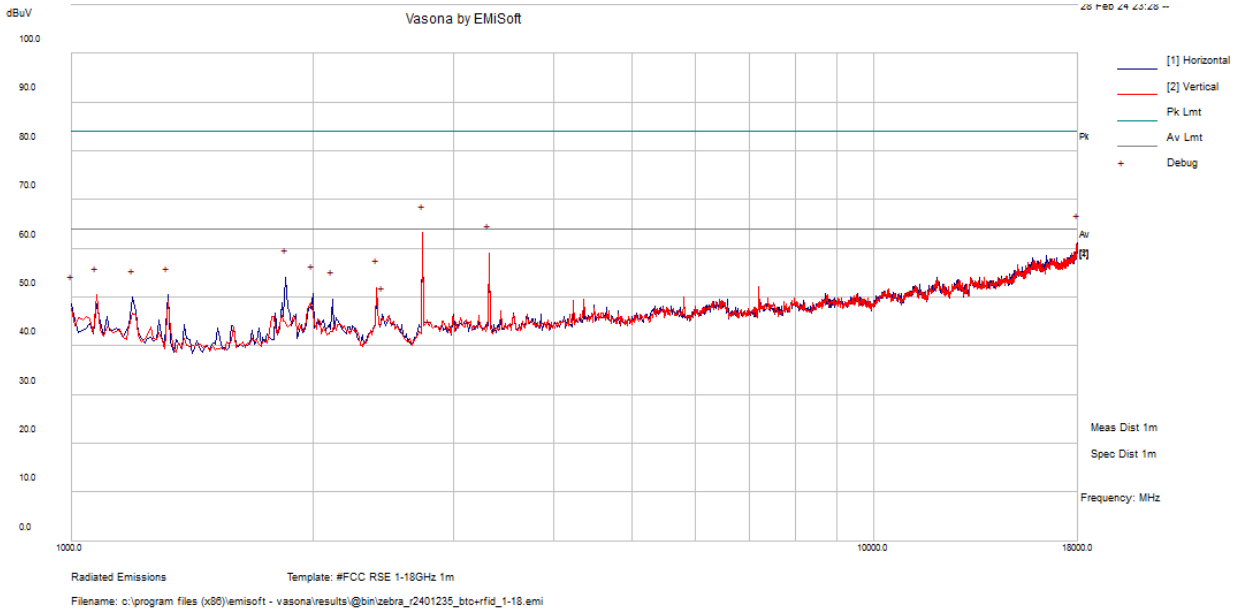
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
388.56975	39.95	-4.57	35.38	277	H	262	46	-10.62	QP
492.70575	33.34	-1.46	31.88	157	H	321	46	-14.12	QP
375.92625	38.39	-4.74	33.65	289	H	71	46	-12.35	QP
393.1235	30.19	-4.44	25.75	191	H	52	46	-20.25	QP
363.2785	34.57	-4.69	29.88	102	H	232	46	-16.12	QP
369.4635	33.46	-4.68	28.78	114	H	84	46	-17.22	QP

FCC/IC Limits for 1 GHz to 40 GHz				
Applicablity	**(dBm)**	**(uV/m at 3meters)**	**(dBuV/m at 3meters)**	**(dBuV/m at 1meter)[2]**
Restricted Band Average Limit	-	500	54	63.54
Restricted Band Peak Limit[1]	-	-	74	83.54

Note[1]: Restricted Band Peak Limit is defined to be 20dB higher than Average Limit.
Note[2]: Limits at 1 meter are determined by applying a Distance correction factor accounts for extrapolation from 1 meters to 3 meters. Formula used is as follows: 20*log(3meters/1meter) = 9.54 (According to ANSI C63.10-2013 Section 9.4)
Note[3]: Ports terminated for radiated measurements.

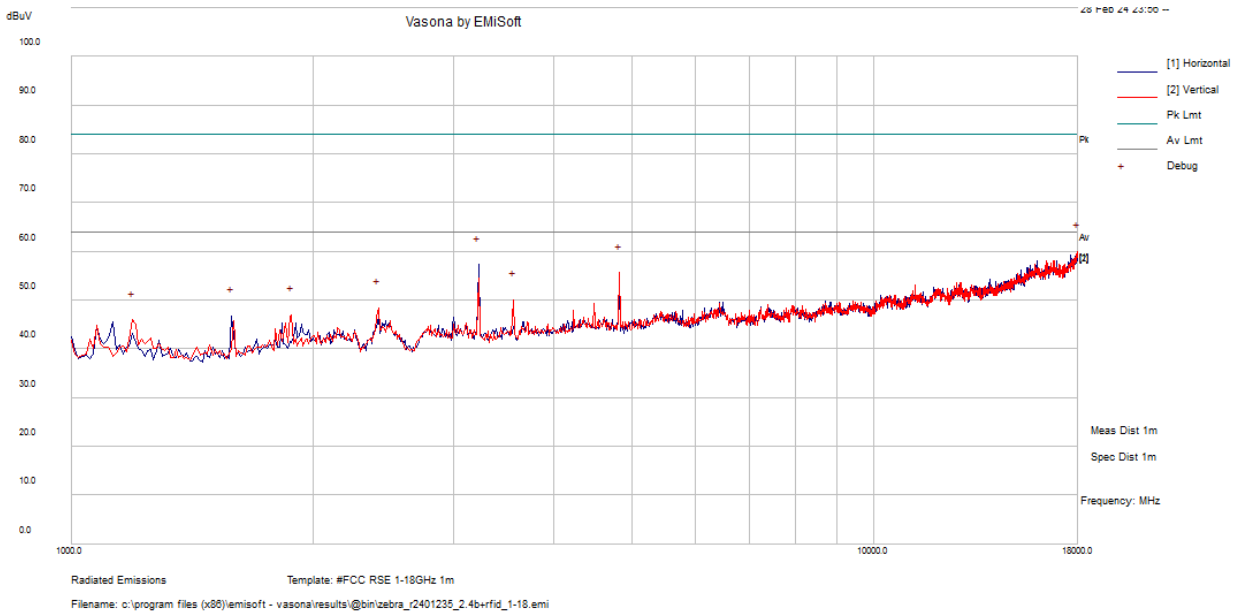
2) 1 GHz – 18 GHz, Measured at 1 meter

AX + RE40
BTC: 2402 MHz + RFID: 902.75 MHz



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)	Detector
2742.5	67.09	-3.88	63.21	200	V	360	83.54	-20.33	Peak
2742.5	62.37	-3.88	58.49	200	V	360	63.54	-5.05	Avg

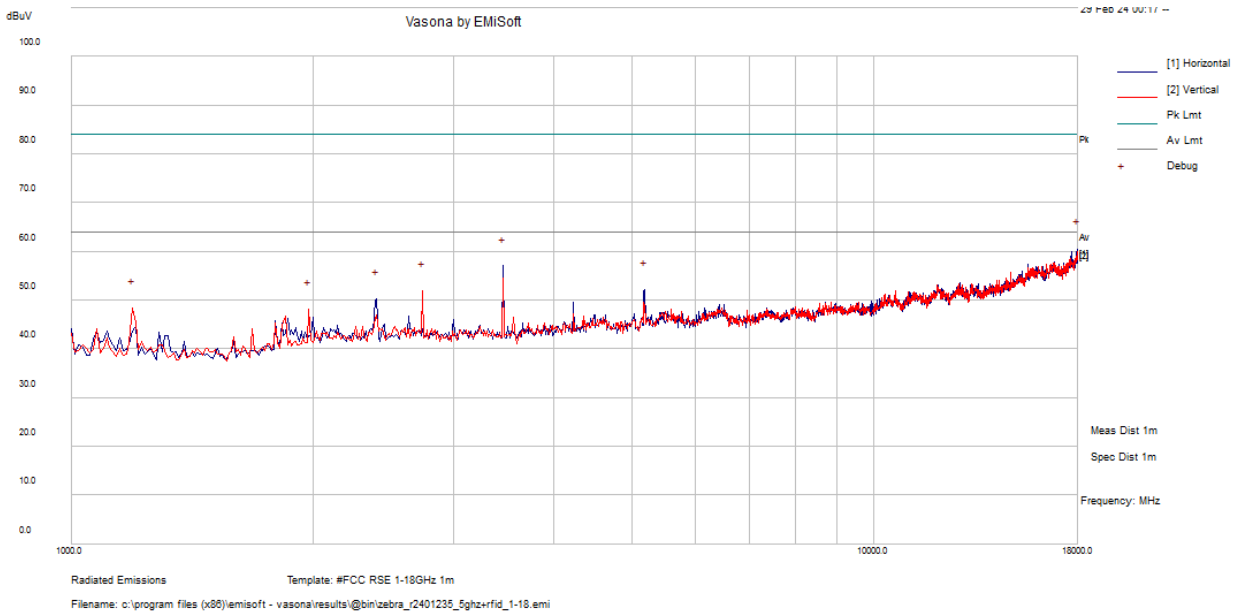
AX + RE40
802.11b: 2437 MHz + RFID: 902.75 MHz



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)	Detector
18000	45.06	14.99	60.05	100	V	360	63.54	-3.49	Peak

Note: Peak measurement is compared to the average limit to show compliance.

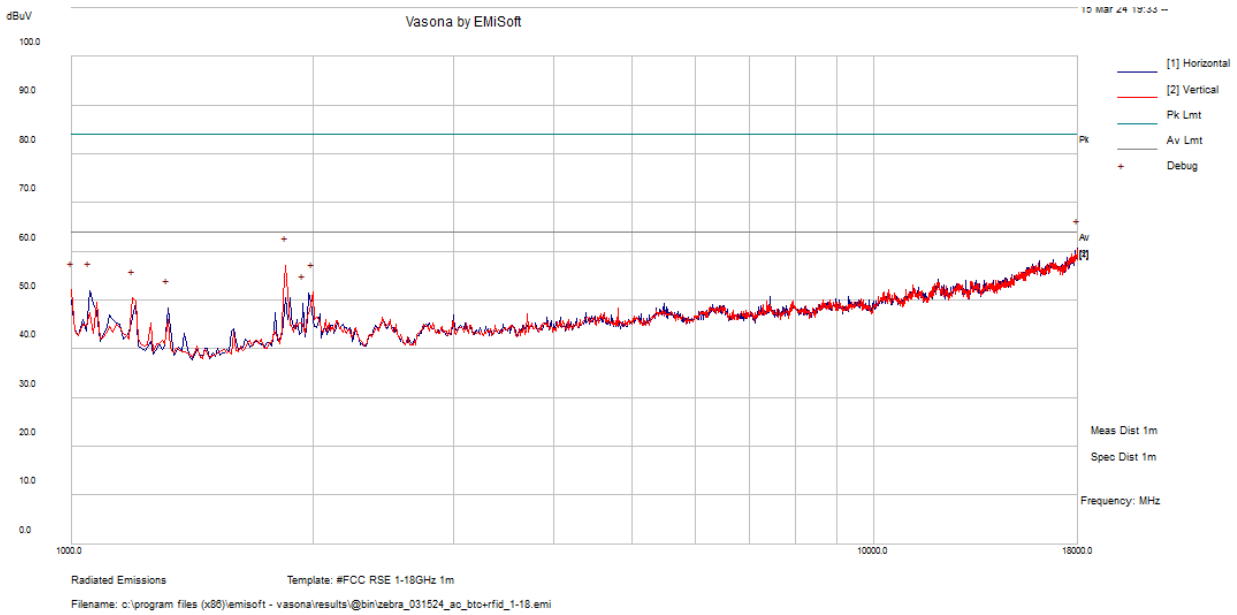
AX + RE40
802.11a: 5180 MHz + RFID: 902.75 MHz



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)	Detector
18000	45.77	14.99	60.76	100	V	360	63.54	-2.78	Peak

Note: Peak measurement is compared to the average limit to show compliance.

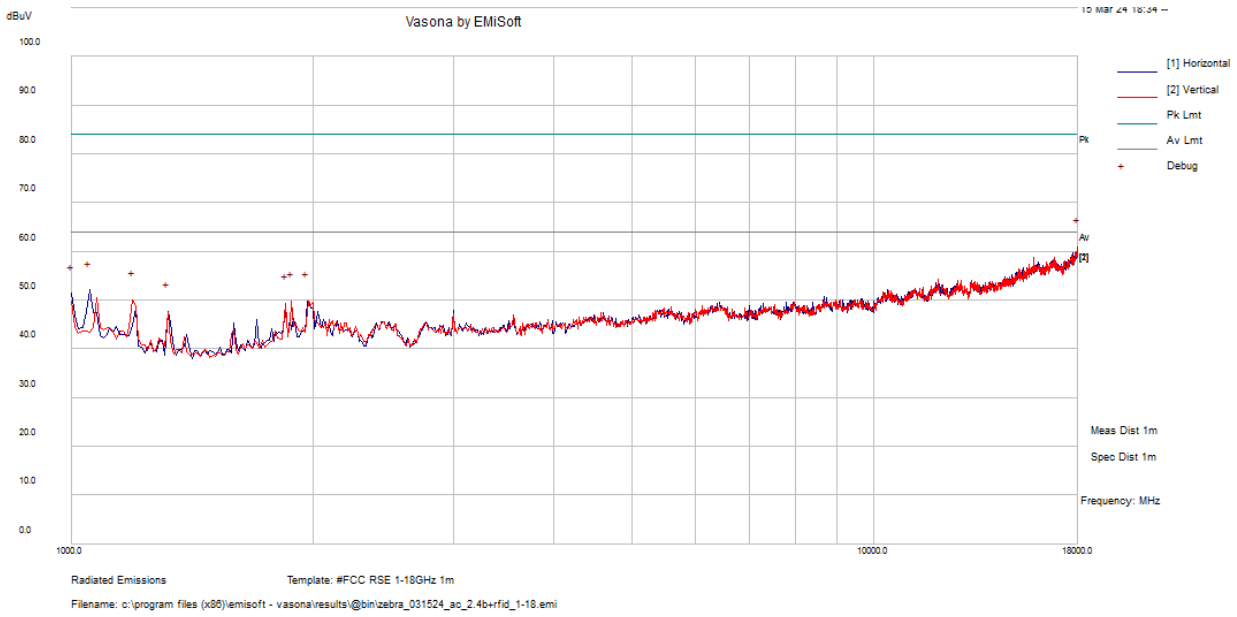
AC + RE40
BTC: 2402 MHz + RFID: 902.75 MHz



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)	Detector
17989.375	45.72	14.92	60.64	100	H	0	63.54	-2.9	Peak

Note: Peak measurement is compared to the average limit to show compliance.

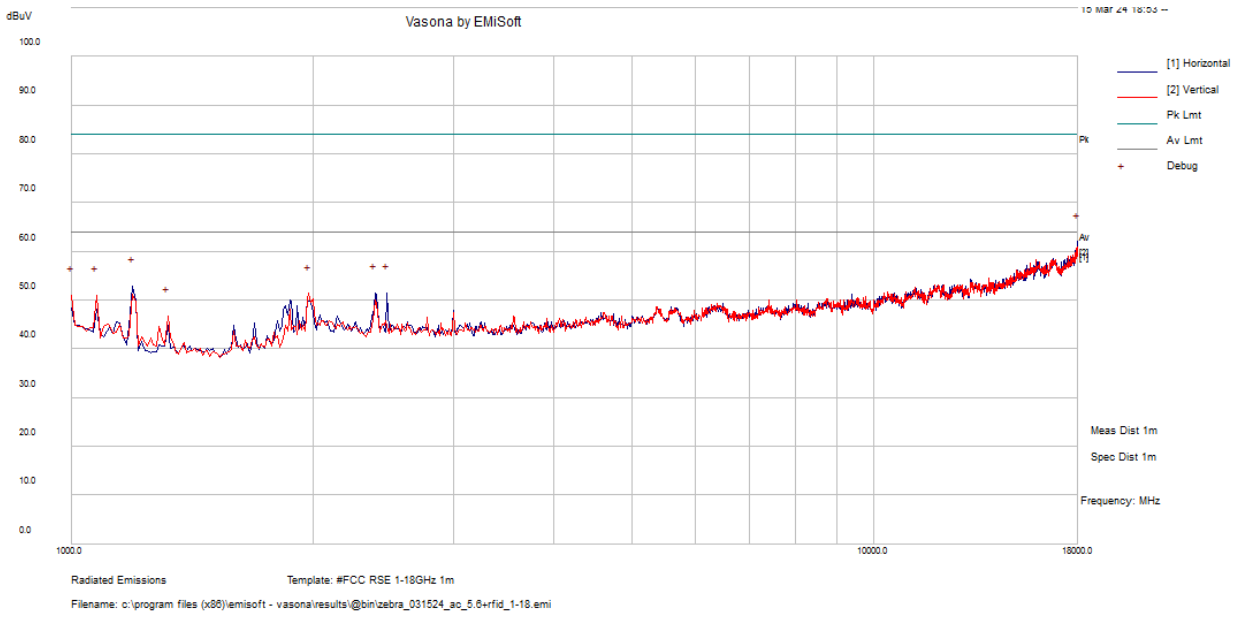
AC + RE40
802.11b: 2437 MHz + RFID: 902.75 MHz



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)	Detector
17989.375	46.06	14.92	60.98	300	V	0	63.54	-2.56	Peak

Note: Peak measurement is compared to the average limit to show compliance.

AC + RE40
802.11a: 5180 MHz + RFID: 902.75 MHz

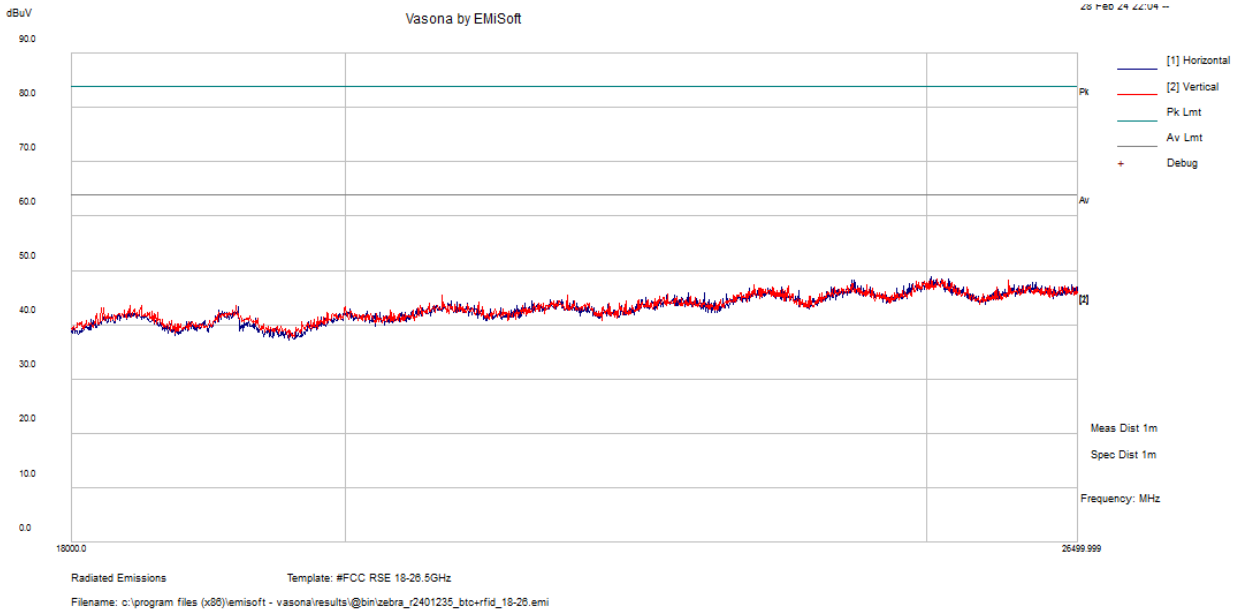


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
17978.75	47.1	14.85	61.95	100	H	0	63.54	-1.59	Peak

Note: Peak measurement is compared to the average limit to show compliance.

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

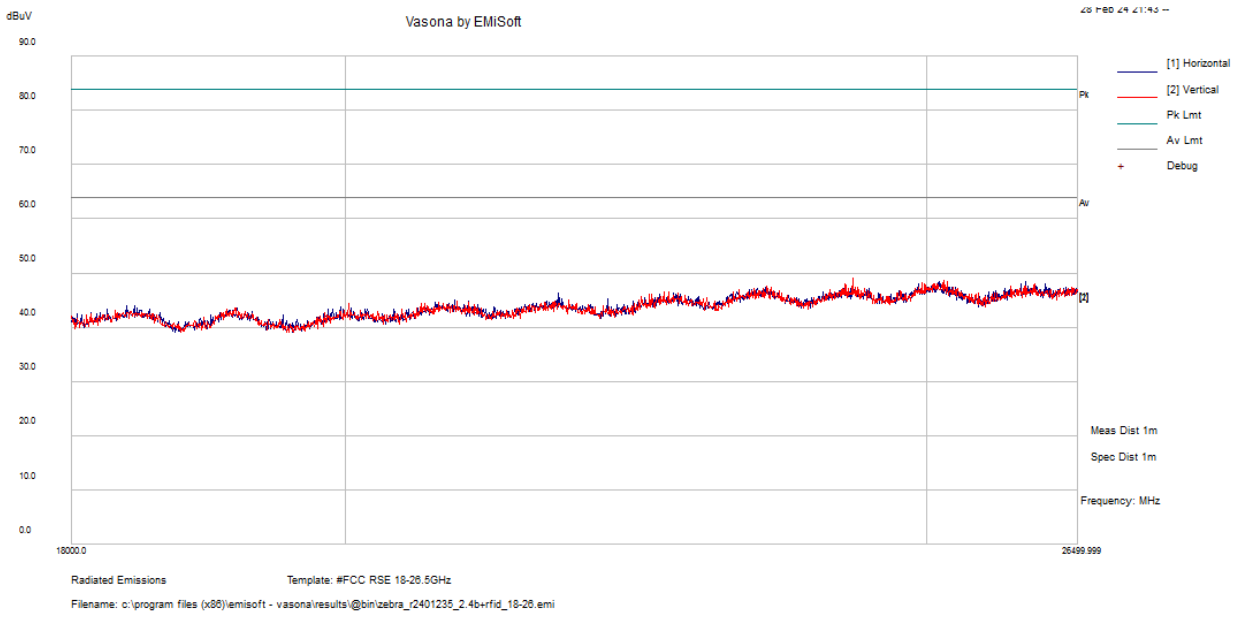
AX + RE40
BTC: 2402 MHz + RFID: 902.75



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)	Detector
25076.249	39.762	7.88	47.642	200	V	360	63.54	-15.898	Peak

Note: Peak measurement is compared to the average limit to show compliance.

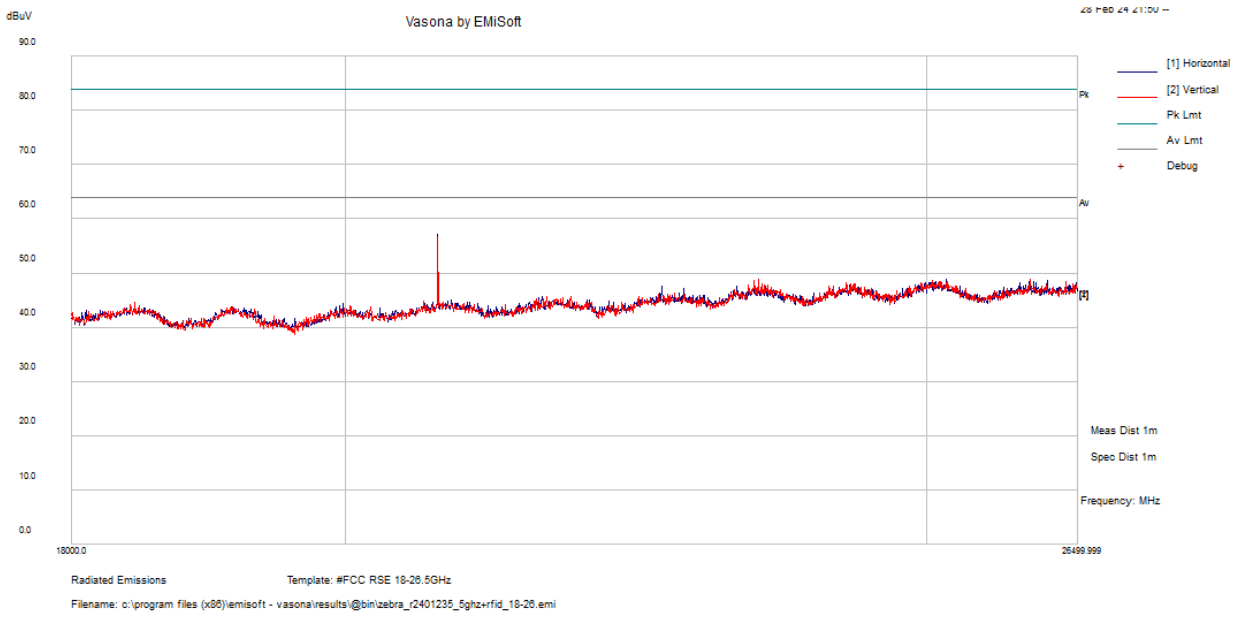
AX + RE40
802.11b: 2437 MHz + RFID: 902.75



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)	Detector
25065.624	39.388	7.88	47.268	200	V	360	63.54	-16.272	Peak

Note: Peak measurement is compared to the average limit to show compliance.

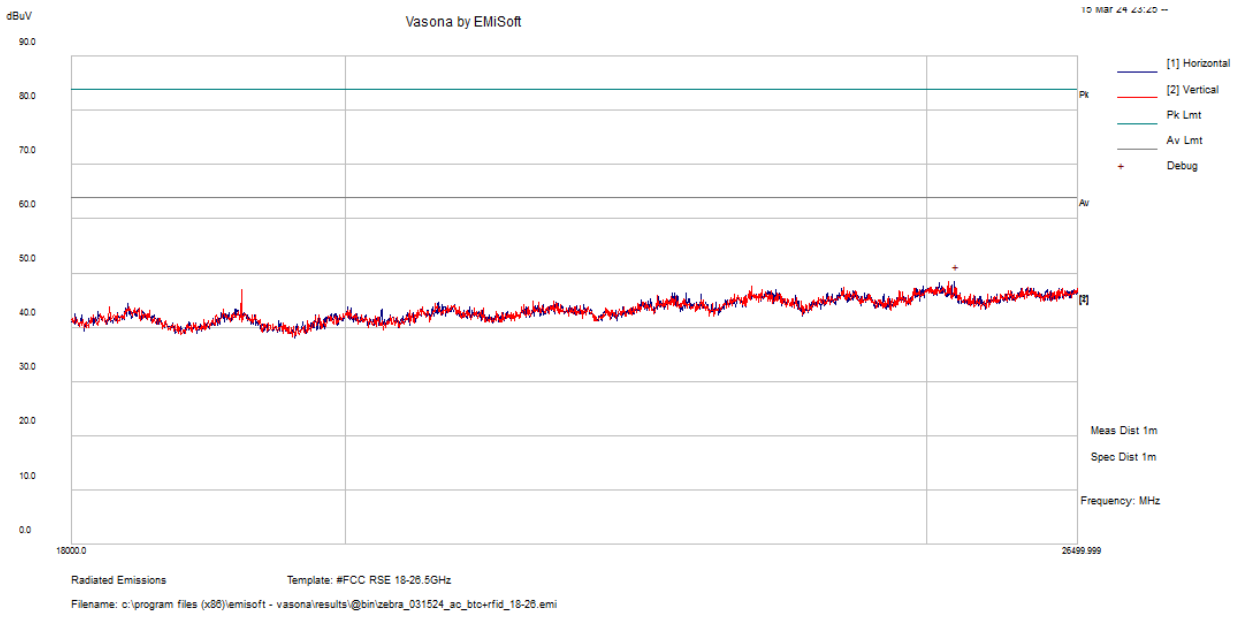
AX + RE40
802.11a: 5180 MHz + RFID: 902.75



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)	Detector
20720	48.924	7.88	56.804	200	V	360	63.54	-6.736	Peak

Note: Peak measurement is compared to the average limit to show compliance.

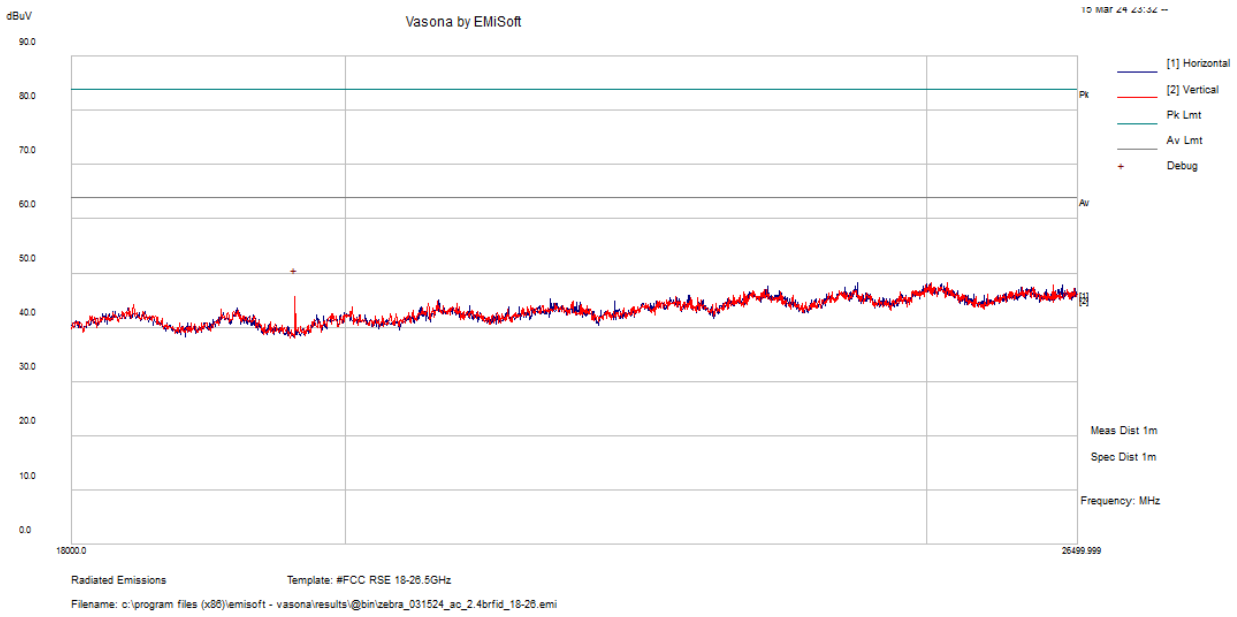
AC + RE40
BTC: 2402 MHz + RFID: 915.25



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)	Detector
25234.647	39.81	7.52	47.33	200	V	7	63.54	-16.21	Peak

Note: Peak measurement is compared to the average limit to show compliance.

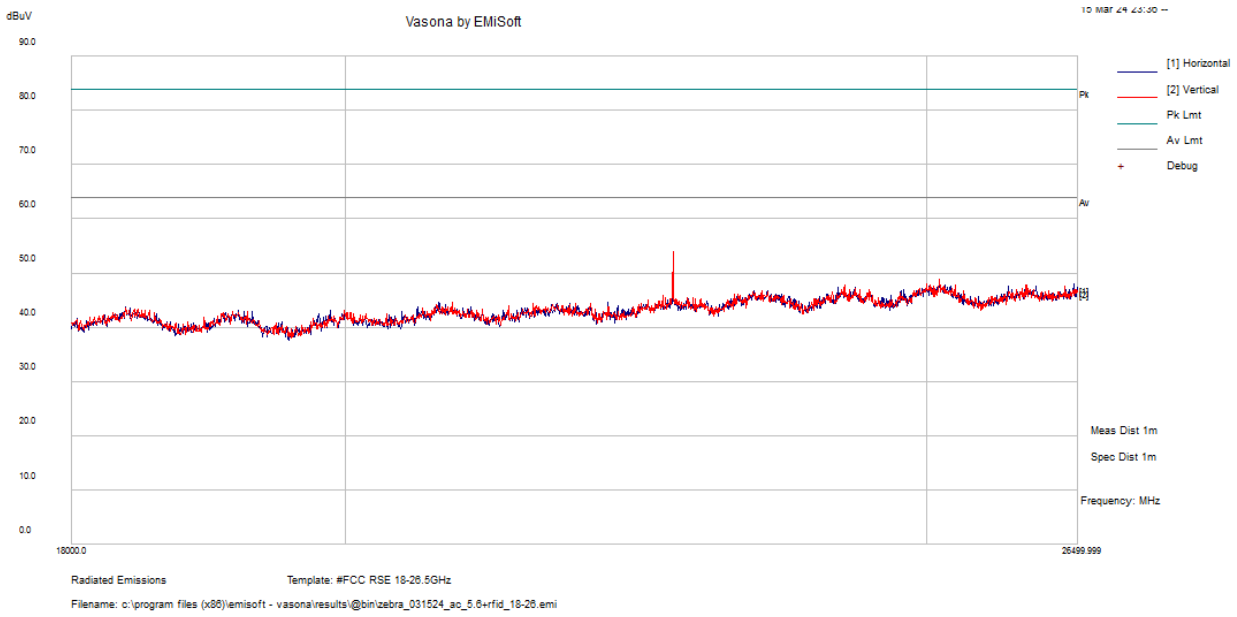
AC + RE40
802.11b: 2437 MHz + RFID: 915.25



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)	Detector
25078.968	39.31	7.88	47.19	200	V	7	64	-16.81	Peak

Note: Peak measurement is compared to the average limit to show compliance.

AC + RE40
802.11a: 5180 MHz + RFID: 915.25

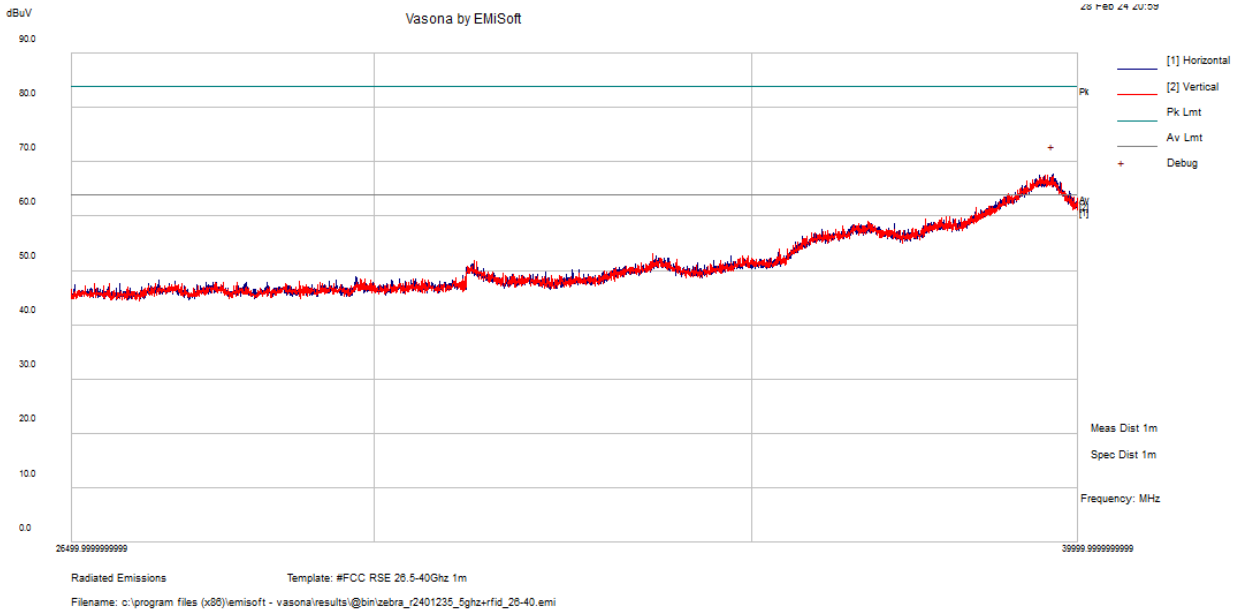


Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Detector
22680.346	49.22	4.7	53.92	200	V	7	64	-10.08	Peak

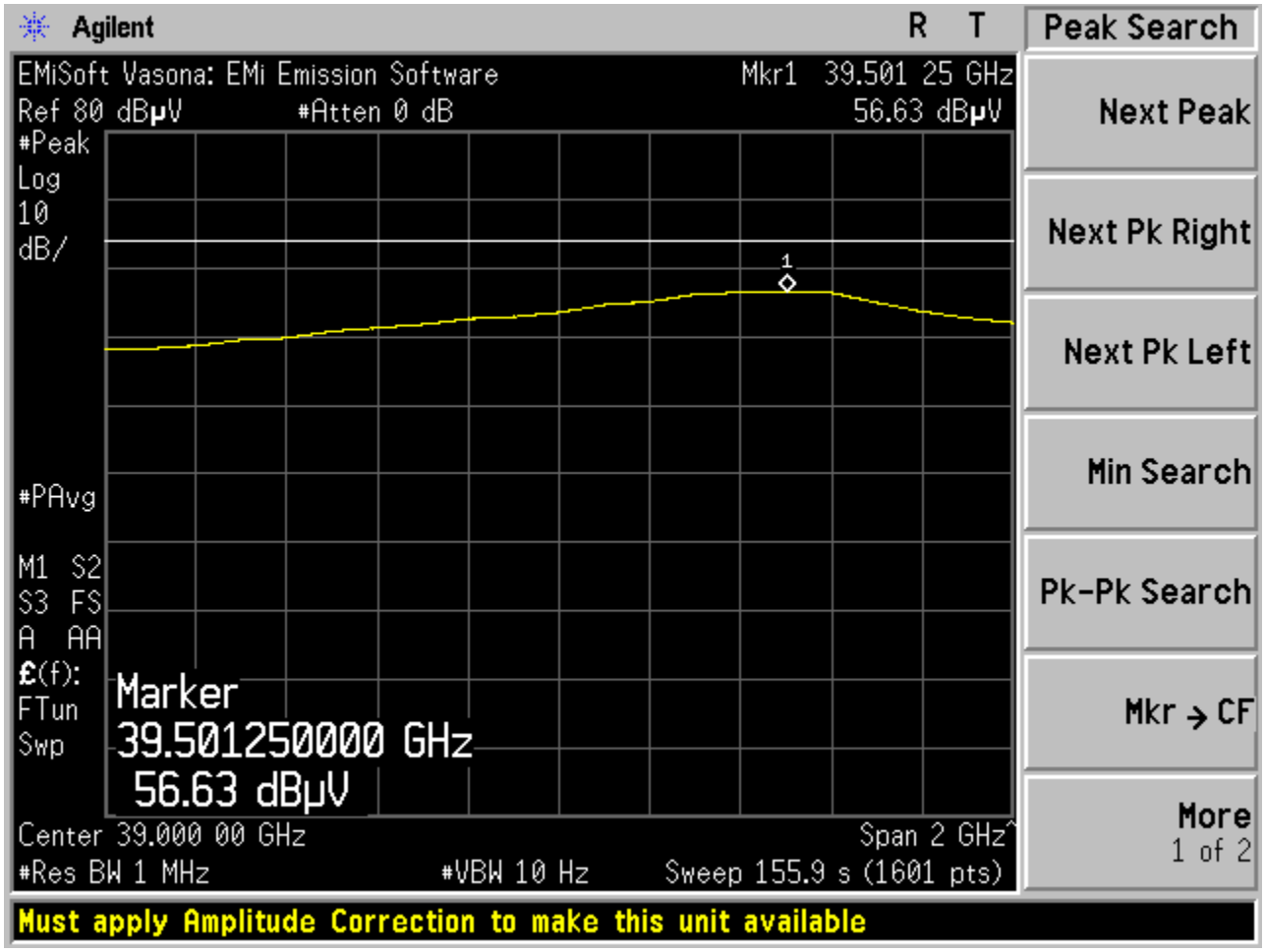
Note: Peak measurement is compared to the average limit to show compliance.

4) 26.5 GHz – 40 GHz, Measured at 1 meter

AX + RE40
802.11a: 5180 MHz + RFID: 902.75



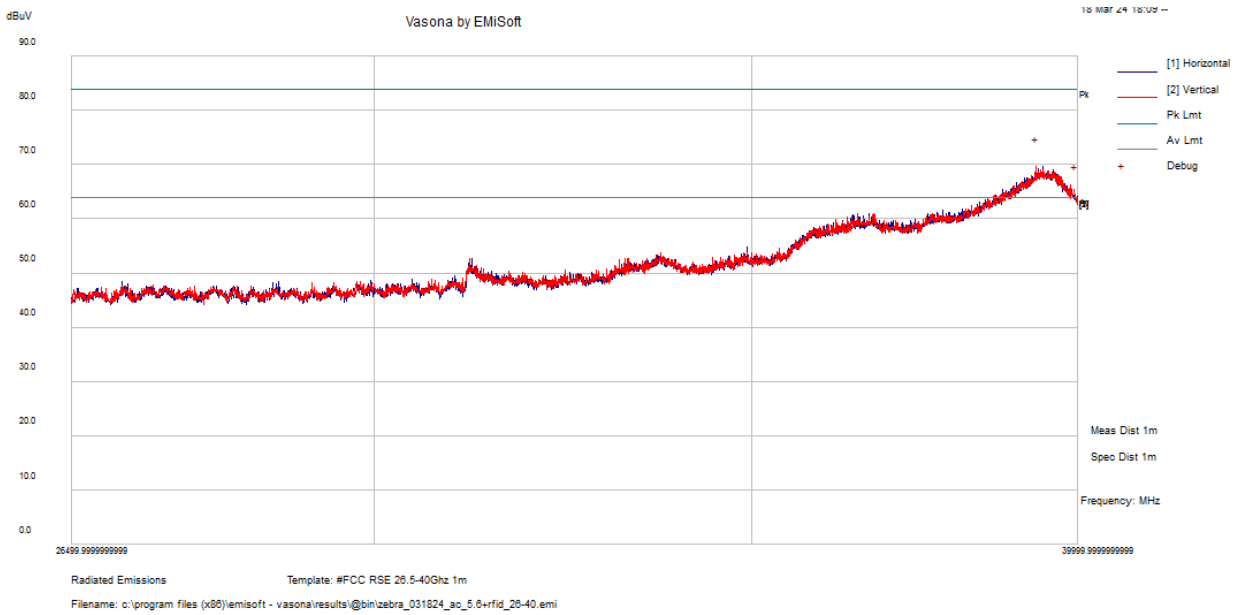
38 – 40 GHz Average Plot



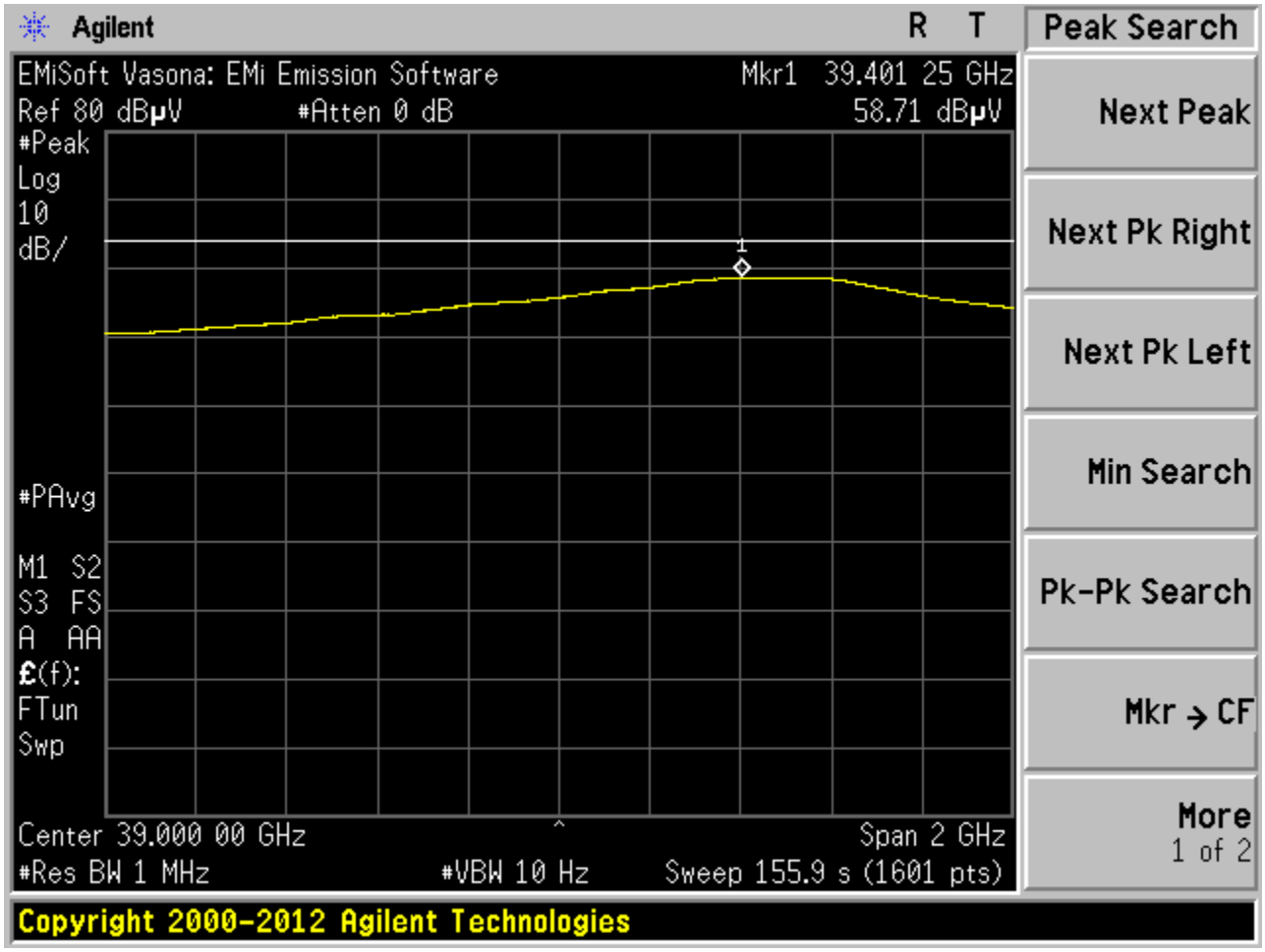
Frequency (MHz)	S.A. Reading (dBuV)	Correction Factor (dB/m)	Corrected Amplitude (dBµV/m)	Antenna Height (cm)	Antenna Polarity (H/V)	Turntable Azimuth (degrees)	Limit (dBµV/m)	Margin (dB)	Test
39501.25	39.68	16.95	56.63	200	V	360	63.54	-6.91	Avg

Note: Reduced RBW used to show that noise floor with EUT transmitting was below the average limit.

AC + RE40
802.11a: 5180 MHz + RFID: 915.25



38 – 40 GHz Average Plot



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)	Test
39401.25	42.08	16.63	58.71	200	V	360	63.54	-4.83	Avg

Note: Reduced RBW used to show that noise floor with EUT transmitting was below the average limit.

5 Appendix A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

6 Appendix B (Normative) – EUT External Photographs

Please refer to the attachment

7 Appendix C (Normative) – EUT Internal Photographs

8 Appendix 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 13th day of September 2024.

Mr. Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2026

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

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