FCC PART 15.225

TEST REPORT

For

Xthings Industry llc

47703 Fremont Blvd,
Fremont, CA 94538 USA

FCC ID: 2BKHH-M7PALM

Report Type: Original Report	**Product Type:** Access Control Device
Prepared By:	Libass Thiaw RF Test Engineer
Report Number:	R2412177-225
Report Date:	2025-01-27
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CERTIFICATE #3297.02

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DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R2412177-225	Original Report	2025-01-27

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report is prepared on behalf of *Xthings Industry llc*, and their product model: M7 Palm *(*FCC ID: 2BKHH-M7PALM) or the "EUT" as referred to in this report. The EUT is an Access Control Device and has RFID capability with operating frequency of 13.56 MHz.

1.2 Mechanical Description of EUT

The EUT measures approximately 16.0 cm (H) x 5.5 cm (W) x 3.5 cm (D) and weighs approximately 0.25 kg.

The data gathered was from a production sample provided by Xthings Industry llc with S/N: 186010002480004.

1.3 Objective

This report is prepared on behalf of *Xthings Industry llc*, in accordance with Part 2, Subpart J, and Part 15, Subpart C of the Federal Communication Commission's rules.

The objective was to determine compliance with FCC Part 15.225 for Antenna Requirement, RF Exposure, Radiated Field Strength, Frequency Tolerance, and Occupied Bandwidth.

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)

None

1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI C63.10-2020, 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.

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-0428.

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 C63.10-2020.

2.2 EUT Exercise Software

There was no exercising software used during testing. The device transmitted immediately upon powered on.

Radio	Frequency (MHz)	Power Setting
RFID	13.56	Default

2.3 Special Equipment

No special equipment was used during testing.

2.4 Equipment Modification

No modifications were made to the EUT during testing.

2.5 Local Support Equipment

None

2.6 Remote Support Equipment

None

2.7 Power Supply and Line Filters

Manufacturer	Description	Model	Serial Number
Volteq	DC Power Supply	HY5003D	160402343

2.8 Interface Ports and Cabling

Cable Description	Length (m)	From	To
Power Cable	< 1	EUT	DC Power Source

3 Summary of Test Results

FCC Rules	Description of Test	Results
FCC §15.203	Antenna Requirements	Compliant
FCC §2.1091 & §1.1307	RF Exposure	Compliant
FCC §15.207	AC Line Conducted Emissions	N/A[1]
FCC §15.225 (a) (b) (c) (d), §15.205, §15.209	Radiated Field Strength (9kHz–30MHz, 30–150MHz)	Compliant
FCC §15.225 (e)	Frequency Tolerance	Compliant
FCC §15.215 (c)	Occupied Bandwidth	Compliant

Note[1]: The EUT is DC powered.

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 §15.203 – 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.

4.2 Antenna Information

External/Internal/ Integral	Antenna Type	Frequency Range (MHz)	Maximum Antenna Gain (dBi)
Integral	PCB Trace/Coil	13.56	N/A

5 FCC §2.1091, §1.1307 – RF Exposure

5.1 Applicable Standards

According to FCC §2.1091, 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.

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

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

5.2 MPE Prediction

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

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

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

5.3 MPE Result

RFID Standalone

Maximum Peak E.R.P. (dBm):	-52.31
Maximum Peak E.R.P. (mW):	0.0000059
Prediction distance (cm):	20
Prediction frequency (MHz):	13.56
Power density of prediction frequency at 20 cm (mW/cm^2):	0.0000000012
FCC MPE limit for uncontrolled exposure at prediction frequency (mW/cm^2):	0.979

The device is compliant with the FCC requirement MPE limit for uncontrolled exposure. The maximum power density at the distance of 20 cm is 0.0000000012 mW/cm^2. Limit is 0.979 mW/cm^2.

Note: Per ANSI C63.10 Sections 10.3.9 and G.4, Max ERP was determined by the following calculation: 45.14 dBuV/m @ 3m – 95.3 – 2.15 dB = -52.31 dBm

6 FCC §15.225 (a), (b), (c), (d), §15.205, §15.209 – Radiated Field Strength

6.1 Applicable Standards

As per FCC §15.225 Operation within the band 13.110-14.010 MHz

a) The field strength of any emissions within the band 13.553-13.567 MHz shall not exceed 15,848 microvolts/meter at 30 meters.
b) Within the bands 13.410-13.553 MHz and 13.567-13.710 MHz, the field strength of any emissions shall not exceed 334 microvolts/meter at 30 meters.
c) Within the bands 13.110-13.410 MHz and 13.710-14.010 MHz the field strength of any emissions shall not exceed 106 microvolts/meter at 30 meters.
d) The field strength of any emissions appearing outside of the 13.110-14.010 MHz band shall not exceed the general radiated emission limits in §15.209.

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 §15.35:

The conducted and radiated emission limits shown in this part are based on the following, unless otherwise specified elsewhere in this part:

a) On any frequency or frequencies below or equal to 1000 MHz, the limits shown are based on measuring equipment employing a CISPR quasi-peak detector function and related measurement bandwidths, unless otherwise specified. The specifications for the measuring instrumentation using the CISPR quasi-peak detector can be found in ANSI C63.4-2014, clause 4 (incorporated by reference, see § 15.38). As an alternative to CISPR quasi-peak measurements, the responsible party, at its option, may demonstrate compliance with the emission limits using measuring equipment employing a peak detector function as long at the same bandwidth as indicated for CISPR quasi-peak measurements are employed.

6.2 Test Setup

The radiated emissions tests were performed in the 5-meter chamber, using the setup in accordance with ANSI C63.10-2020. The specification used was the FCC §15.225 & §15.209 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.

6.3 Test Procedure

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

The EUT is set 3 meter away from the testing antenna for frequency below 30 MHz and set 3 meters away from the testing antenna for frequency from 30 MHz to 150 MHz, and the EUT is placed on a turntable, which is 0.8 meter above ground plane, the table shall be rotated for 360 degrees to find out the highest emission. The receiving antenna should be changed the polarization both of perpendicular and parallel.

The spectrum analyzer or receiver was set as:

Below 150 kHz:

RBW = 200 Hz / VBW = 600 Hz / Sweep = Auto / Average

From 150 kHz to 30 MHz:

RBW = 9 kHz / VBW = 27 kHz / Sweep = Auto / Average

From 30 MHz to 1 GHz:

RBW = 120 kHz / VBW = 300 kHz / Sweep = Auto / Average

6.4 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:

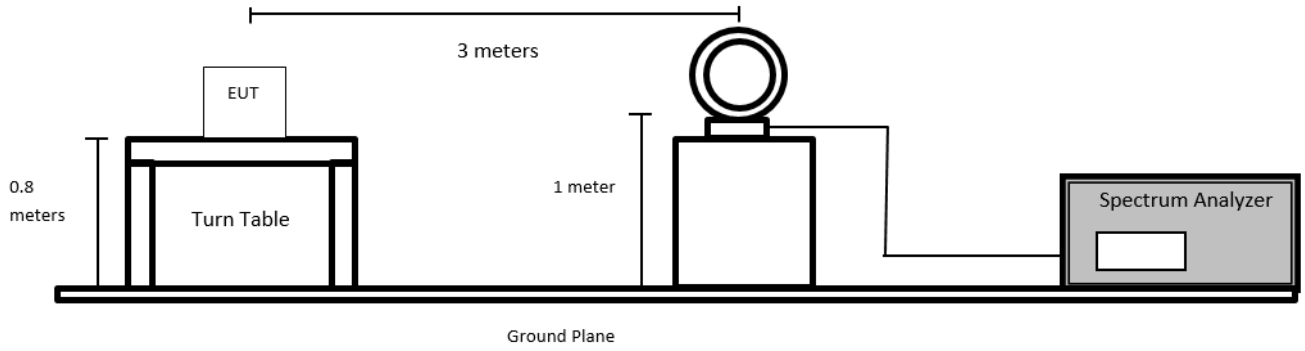
Correction Factor = AF + CL + Atten – Ga

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:

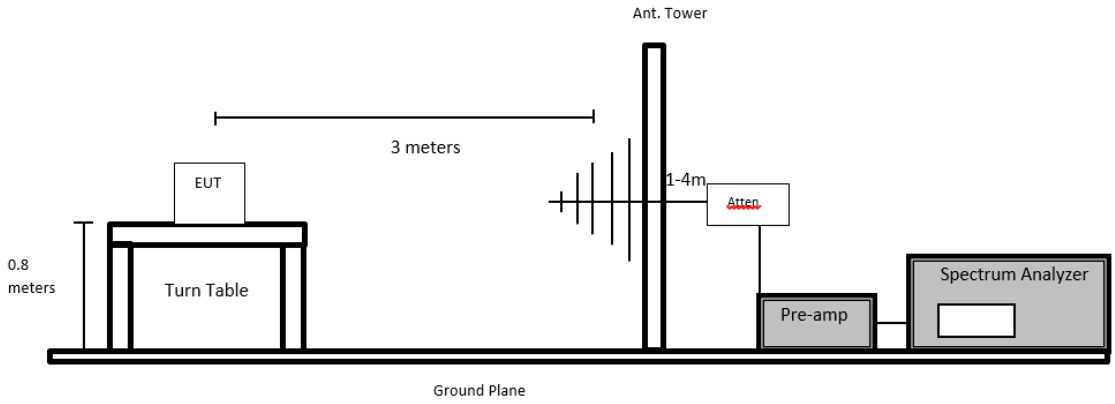
Margin = Corrected Amplitude – Limit

6.5 Test Setup Diagrams

9 kHz to 30 MHz at 3 meters distance



30 MHz to 150 MHz at 3 meters distance



6.6 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
327	Sunol Sciences	System Controller	SC110V	122303-1	N/R	N/A
1075	Sunol Sciences	Boresight Tower	TLT3	050119-7	N/R	N/A
1388	Sunol Sciences	Flush Mount Turntable	FM	112005-2	N/R	N/A
316	Sonoma Instruments	Preamplifier 10 kHz - 2.5 GHz	317	260406	2024-08-30	6 months
1427	Keysight Technologies	PXE EMI Receiver	N9048B	MY59500006	2024-12-23	1 year
321	Sunol Sciences	Biconilog Antenna	JB3	A020106-2; 1504	2023-12-18	2 years
1359	Pasternack	N 600in RF Cable	PE3496LF-600	-	2024-07-26	6 months
1245	-	6dB Attenuator	PE7390-6	01182018A	2023-12-18	2 years
1246	Hewlet Packard	RF Limiter	11867A	01734	2024-04-09	1 year
1248	Pasternack	RG214 COAX Cable	PE3062	-	2024-04-09	1 year
393	Com-Power	Antenna, Loop Active	AL-130	17043	2023-05-26	2 years
1249	Time microwave	LMR-400 Cable Dc-3 GHz	AE13684	2k80612-5 6fts	2024-04-09	1 year
1359	Pasternack	N 600in RF Cable	PE3496LF-600	-	2024-07-26	6 months

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:	23 °C
Relative Humidity:	49 %
ATM Pressure:	101.4 kPa

The testing was performed by Libass Thiaw from 2024-12-31 to 2025-01-21 in 5m chamber 3.

6.8 Summary of Test Results

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

Worst Case – Mode: Transmitting			
Margin (dB)	**Frequency (MHz)**	**Polarization**	**Range**
-58.91	13.567	Parallel	9kHz – 30MHz
-0.67	125.012188	Horizontal	30 MHz – 150 MHz

Please refer to Section 6.10 for detailed test result.

6.9 Radiated Field Strength Test Results

Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna		Cable Loss (dB)	Cord. Reading (dBµV/m)	FCC		Detector
			Height (cm)	Factor (dB/m)			Limit (dBµV/m)	Margin (dB)	
Loop Parallel									
13.56	34.56	4	80	10.36	0.22	45.14	124	-78.86	QP
13.553	18.85	8	80	10.36	0.22	29.43	90.47	-61.04	QP
13.567	**20.98**	**4**	**80**	**10.36**	**0.22**	**31.56**	**90.47**	**-58.91**	**QP**
13.359	10.54	6	80	10.36	0.22	21.12	80.51	-59.39	QP
13.725	10.26	4	80	10.26	0.22	20.74	80.51	-59.77	QP

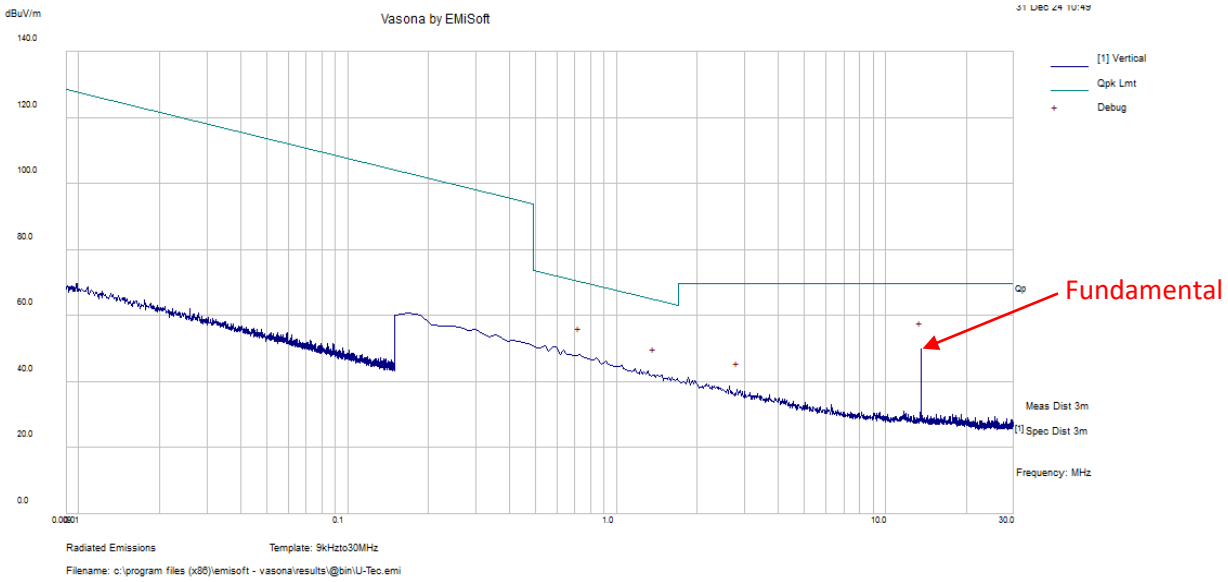
Frequency (MHz)	S.A. Reading (dBµV)	Turntable Azimuth (degrees)	Test Antenna		Cable Loss (dB)	Cord. Reading (dBµV/m)	FCC		Detector
			Height (cm)	Factor (dB/m)			Limit (dBµV/m)	Margin (dB)	
Loop Perpendicular									
13.56	31.86	86	80	10.36	0.22	42.44	124	-81.56	QP
13.553	16.58	90	80	10.36	0.22	27.16	90.47	-63.31	QP
13.567	18.54	84	80	10.36	0.22	29.12	90.47	-61.35	QP
13.358	10.78	86	80	10.36	0.22	21.36	80.51	-59.15	QP
13.911	10.66	88	80	10.26	0.22	21.14	80.51	-59.37	QP

Note: the distance extrapolation factor (40 dB/decade) is used for below 30 MHz.

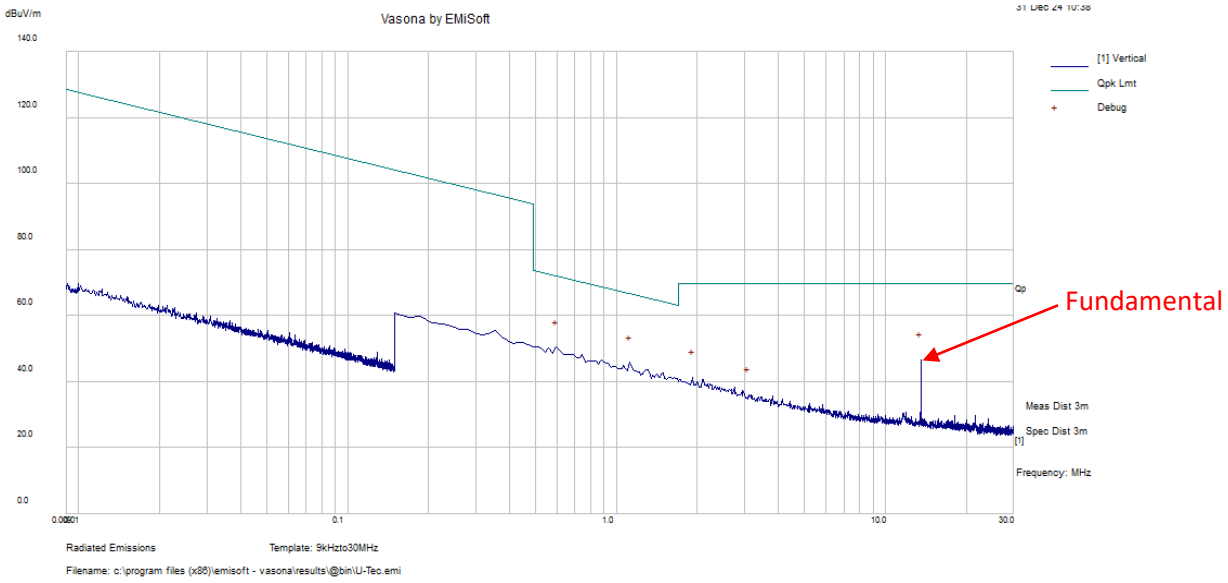
6.10 Radiated Spurious Emissions Test Results

1) 9 kHz – 30 MHz, Measured at 3 meters

Parallel

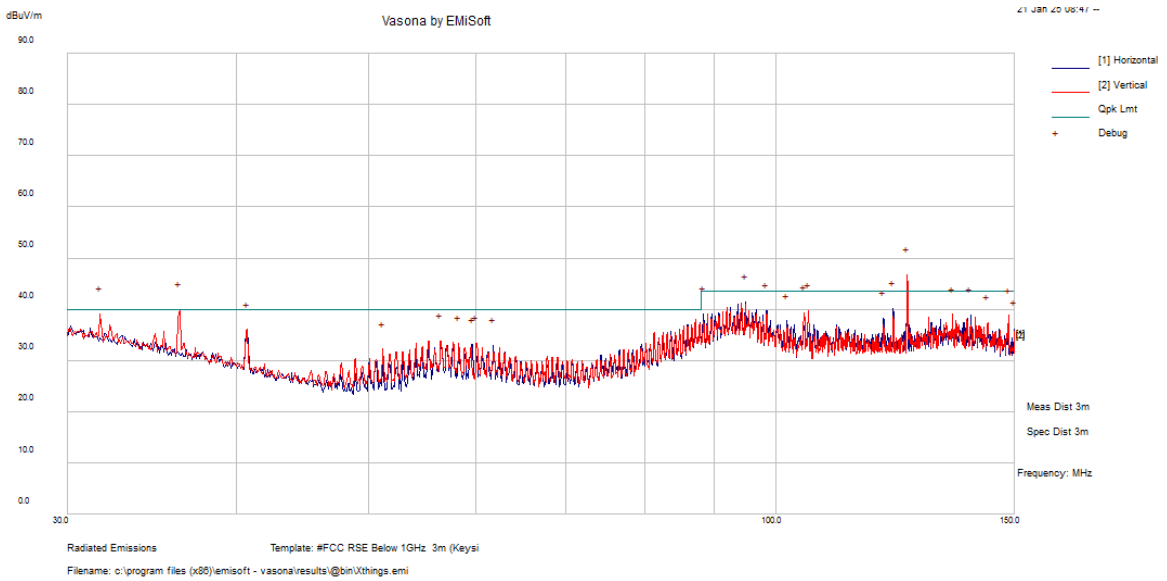


Perpendicular



Note 1: The Peak measurement is used to show compliance, which is evaluated against the Quasi-Peak Limit.
Note 2: The plot above shows that apart from the fundamental, there were no emissions above the noise floor at 9 kHz – 30 MHz frequency range.

2) 30 MHz – 150 MHz, Measured at 3 meters



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
125.012188	**49.38**	**-6.55**	**42.83**	**189**	**H**	**228**	**43.5**	**-0.67**	**QP**
36.32	29.26	-5.02	24.24	181	V	297	40	-15.76	QP
31.656875	29.56	-2.01	27.55	253	V	264	40	-12.45	QP
94.960938	45.41	-11.32	34.09	233	H	7	43.5	-9.41	QP
122.035938	42.97	-6.62	36.35	209	H	14	43.5	-7.15	QP
98.461875	46.11	-10.36	35.75	249	H	316	43.5	-7.75	QP

7 FCC §15.225 (e) – Frequency Tolerance

7.1 Applicable Standards

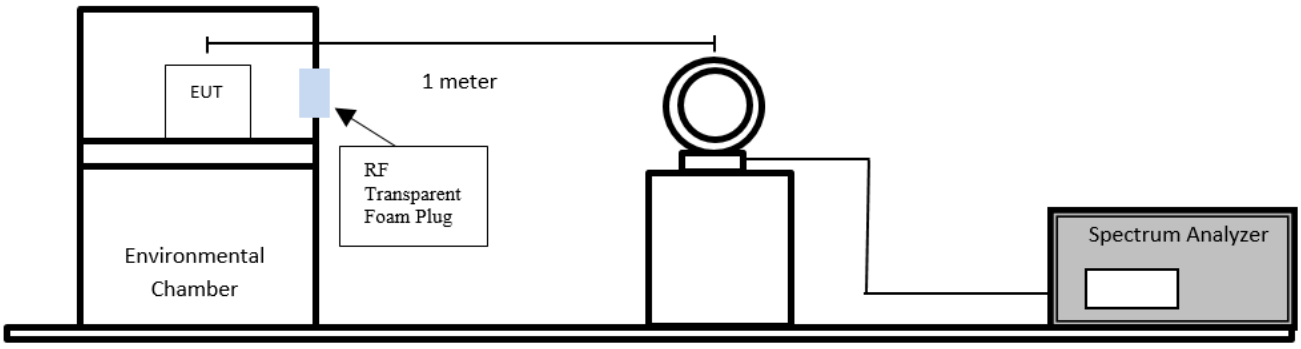
As per FCC §15.225(e): Operation within the band 13.110-14.010 MHz

e) The frequency tolerance of the carrier signal shall be maintained within ±0.01% of the operating frequency over a temperature variation of −20 degrees to + 50 degrees C at normal supply voltage, and for a variation in the primary supply voltage from 85% to 115% of the rated supply voltage at a temperature of 20 degrees C. For battery operated equipment, the equipment tests shall be performed using a new battery.

7.2 Test Procedure

The radiated emissions tests were performed in accordance with ANSI C63.10-2020.

7.3 Test Setup Block Diagram



7.4 Test Equipment List and Details

Bacl No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
1461	Rohde & Schwarz	Signal Analyzer	FSQ26	200103	2024-08-06	1 year
1060	BACL	Temp and Humi Chamber	BTH-150-40	30078	2024-12-03	1 year
393	Com-Power	Active Loop Antenna	AL-130	17043	2023-05-26	2 years
-	-	RF Cable	-	-	Each time[1]	N/A

Note[1]: cable included in the test set-up will be checked each time before testing.

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

7.5 Test Environmental Conditions

Temperature:	24.1 °C
Relative Humidity:	43 %
ATM Pressure:	101.8 kPa

The testing was performed by Libass Thiaw on 2024-12-26 at RF test site.

7.6 Test Results

Normal Voltage 12V

Temperature °C	Operating Frequency (MHz)	Measured Frequency (MHz)	Frequency Tolerance (ppm)	Limit (ppm)	Result
-20	13.56	13.56035000	25.81	±100	Pass
-10	13.56	13.56043013	31.72	±100	Pass
0	13.56	13.56035000	25.81	±100	Pass
10	13.56	13.56035000	25.81	±100	Pass
20	13.56	13.56002949	2.17	±100	Pass
30	13.56	13.56035000	25.81	±100	Pass
40	13.56	13.56035000	25.81	±100	Pass
50	13.56	13.56018974	13.99	±100	Pass

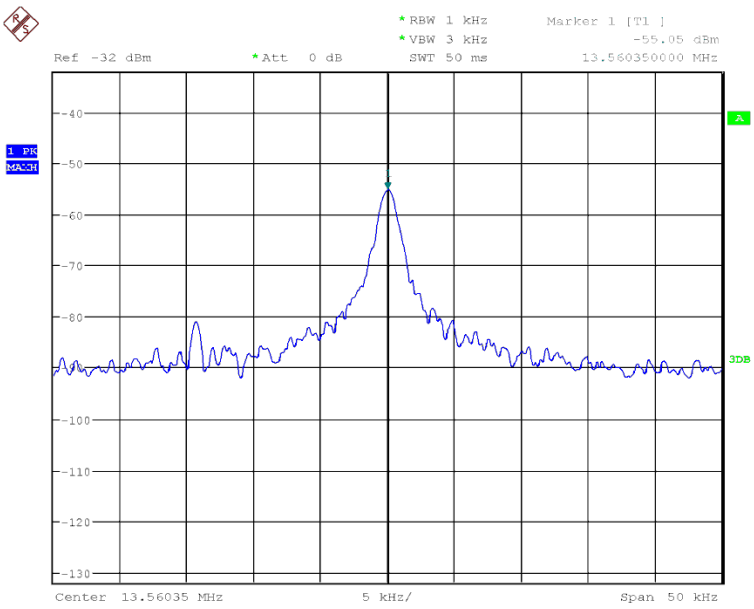
Normal Temperature 20°C

Voltage (V)	Operating Frequency (MHz)	Measured Frequency (MHz)	Frequency Tolerance (ppm)	Limit (ppm)	Result
10.2	13.56	13.56035000	25.81	±100	Pass
13.8	13.56	13.56026987	19.90	±100	Pass

Note: Frequency Tolerance [ppm] = (Measured Frequency [MHz] – Operating Frequency [MHz]) / Operating Frequency [MHz] * 1000000

Please refer to the plots below for detailed test result.

Normal Voltage, Temperature at -20°C



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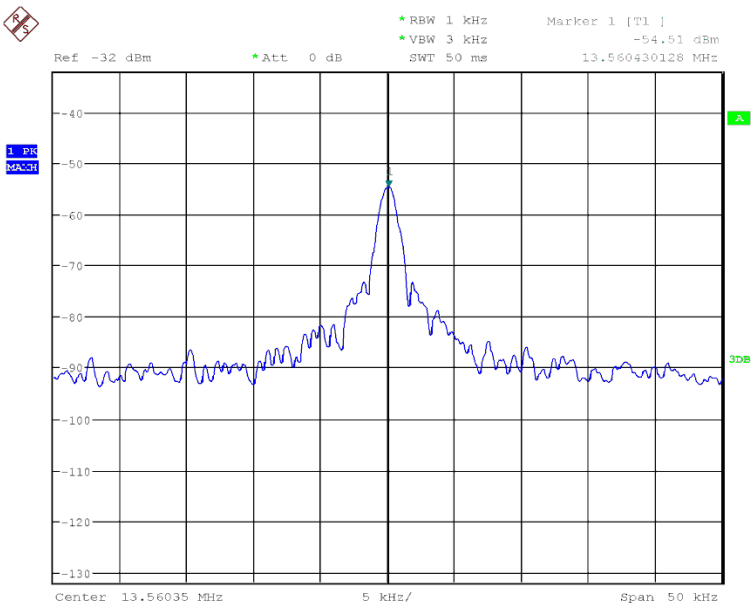
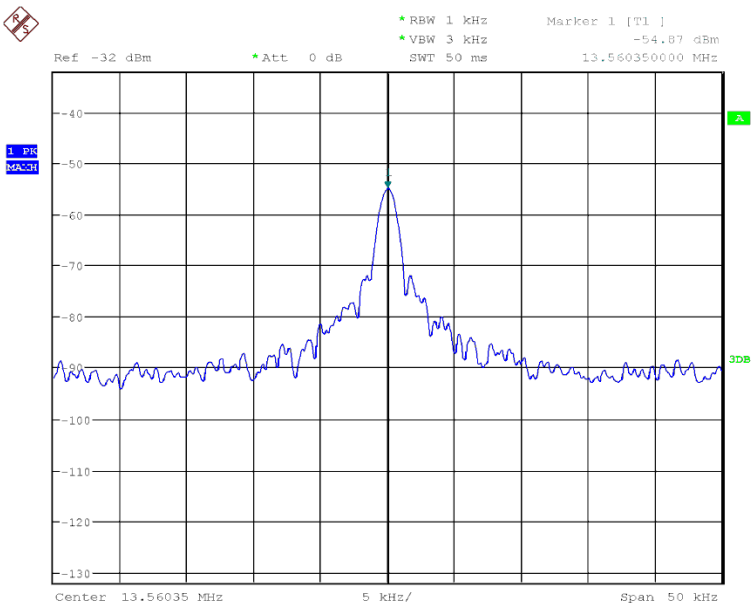
Normal Voltage, Temperature at -10 °C



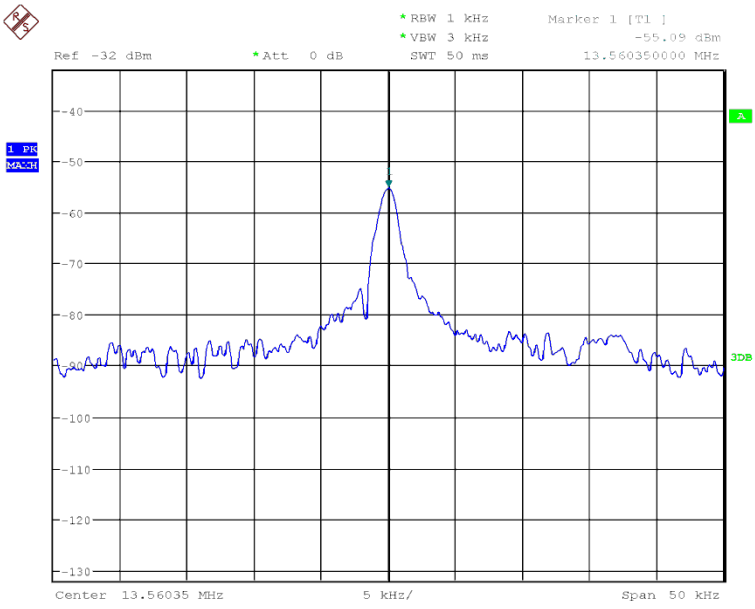
Date: 26.DEC.2024 19:36:49

Normal Voltage, Temperature at 0°C



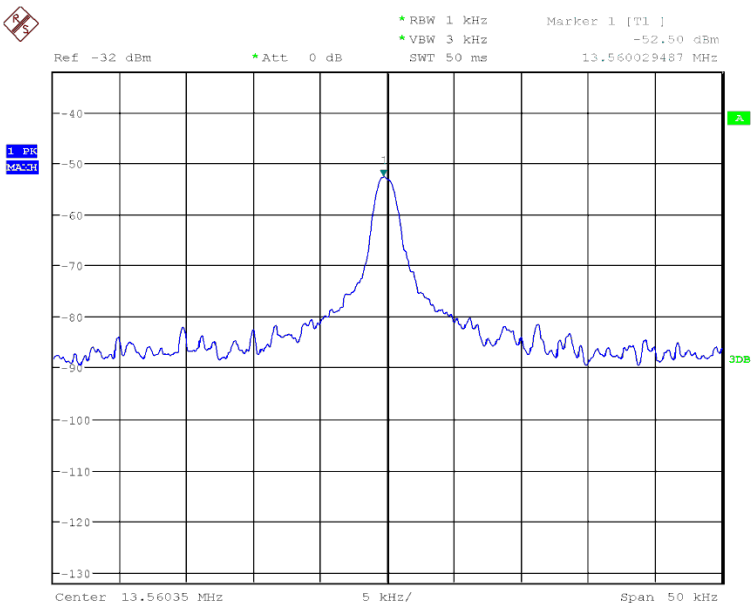
Date: 26.DEC.2024 19:29:22

Normal Voltage, Temperature at 10°C



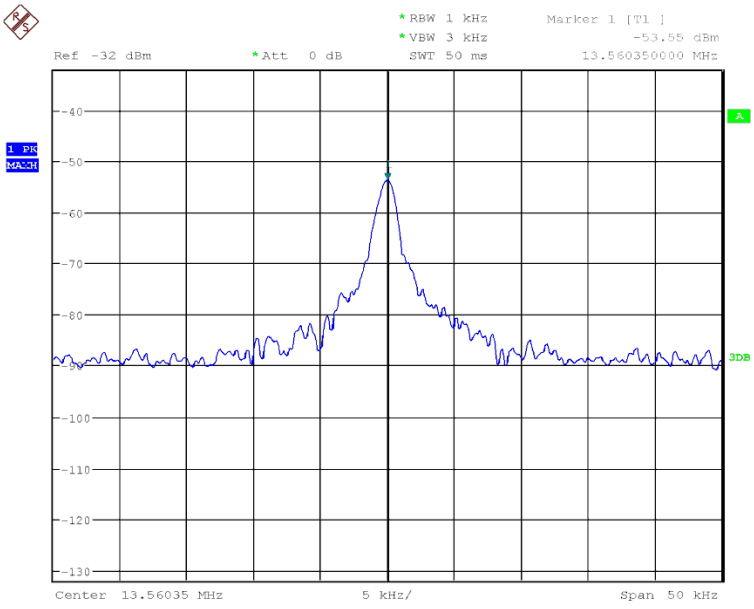
Date: 26.DEC.2024 19:22:53

Normal Voltage, Temperature at 20°C



Date: 26.DEC.2024 20:00:21

Normal Voltage, Temperature at 30°C



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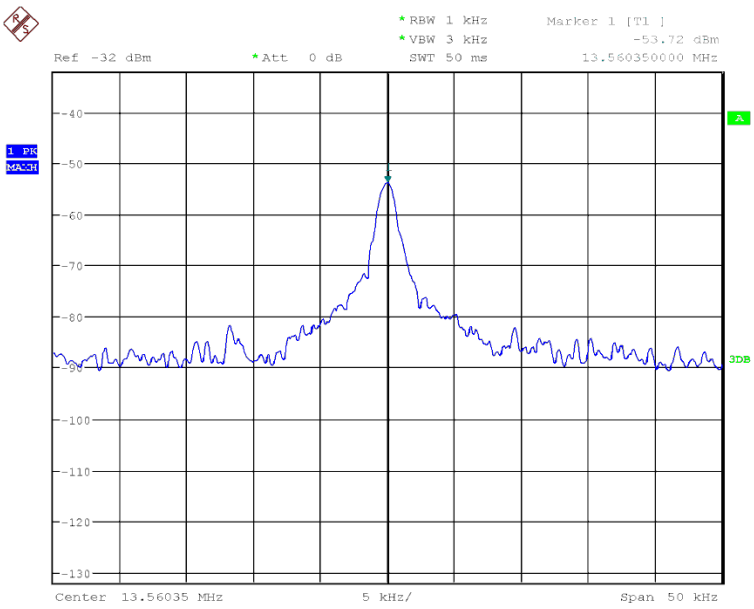
Normal Voltage, Temperature at 40°C



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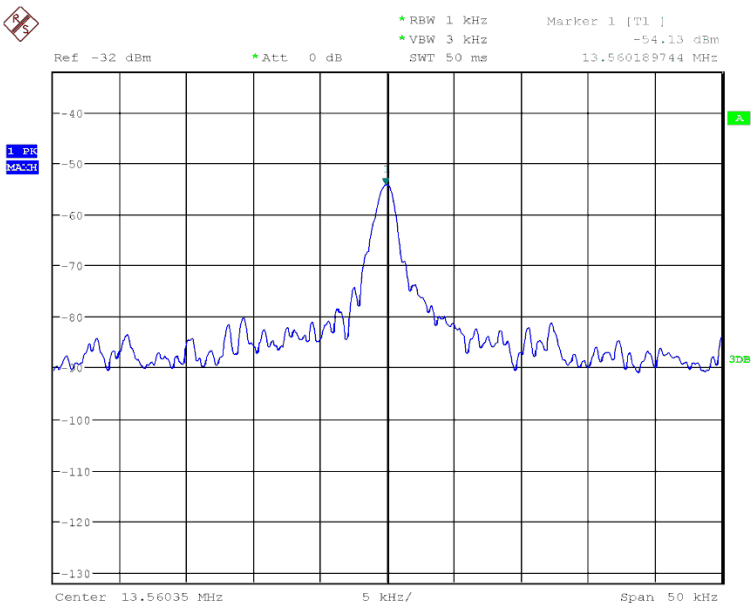
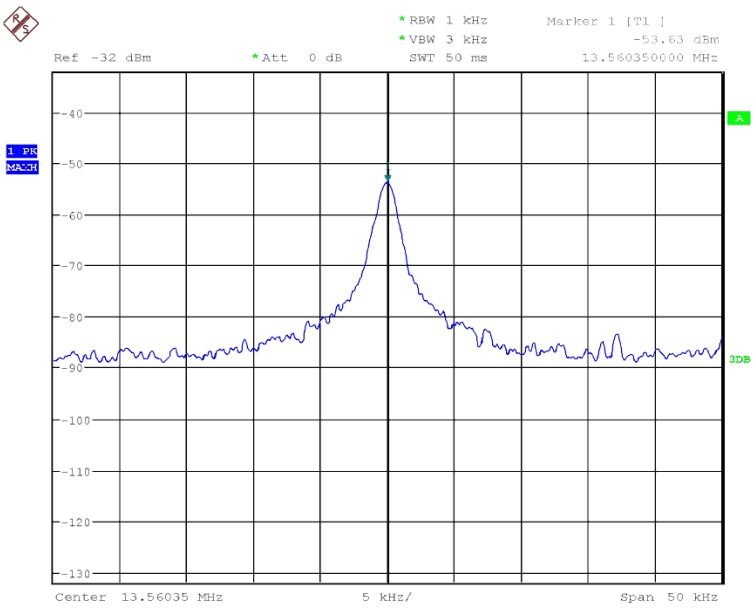
Normal Voltage, Temperature at 50°C



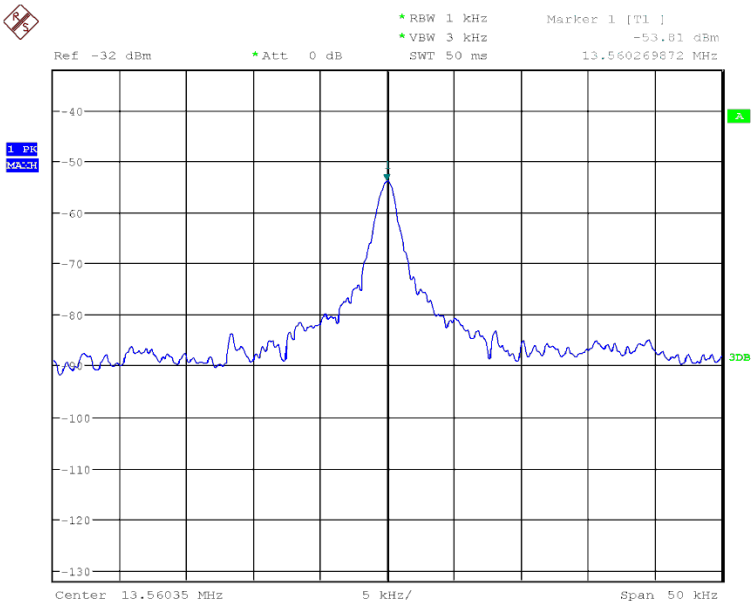
Date: 26.DEC.2024 20:26:18

Normal Temperature, Voltage at 10.2V (Low)



Date: 26.DEC.2024 20:41:04

Normal Temperature, Voltage at 13.8V (High)



Date: 26.DEC.2024 20:43:38

8 FCC §15.225 (c) – Occupied Bandwidth

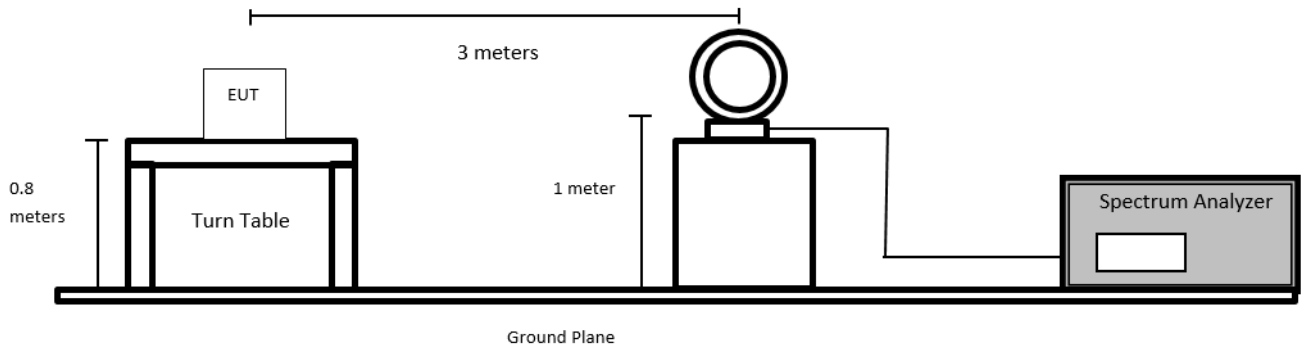
8.1 Applicable Standards

As per FCC §15.215(c): Intentional radiators operating under the alternative provisions to the general emission limits, as contained in §15.217 through 15.257 and in subpart E of this part, must be designed to ensure that the 20 dB bandwidth of the emission, or whatever bandwidth may otherwise be specified in the specific rule section under which the equipment operates, is contained within the frequency band designated in the rule section under which the equipment is operated. In the case of intentional radiators operating under the provisions of subpart E, the emission bandwidth may span across multiple contiguous frequency bands identified in that subpart. The requirement to contain the designated bandwidth of the emission within the specified frequency band includes the effects from frequency sweeping, frequency hopping and other modulation techniques that may be employed as well as the frequency stability of the transmitter over expected variations in temperature and supply voltage. If a frequency stability is not specified in the regulations, it is recommended that the fundamental emission be kept within at least the central 80% of the permitted band in order to minimize the possibility of out-of-band operation.

8.2 Test Procedure

The radiated emissions tests were performed in the 5-meter Chamber, using the setup in accordance with ANSI C63.10-2020.

8.3 Test Setup Block Diagram



8.4 Test Equipment List and Details

BACL No.	Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
1461	Rohde & Schwarz	Signal Analyzer	FSQ26	200103	2024-08-06	1 year
393	Com-Power	Active Loop Antenna	AL-130	17043	2023-05-26	2 years
-	-	RF Cable	-	-	Each time[1]	N/A

Note[1]: cable 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".*

8.5 Test Environmental Conditions

Temperature:	24.1 °C
Relative Humidity:	43 %
ATM Pressure:	101.8 kPa

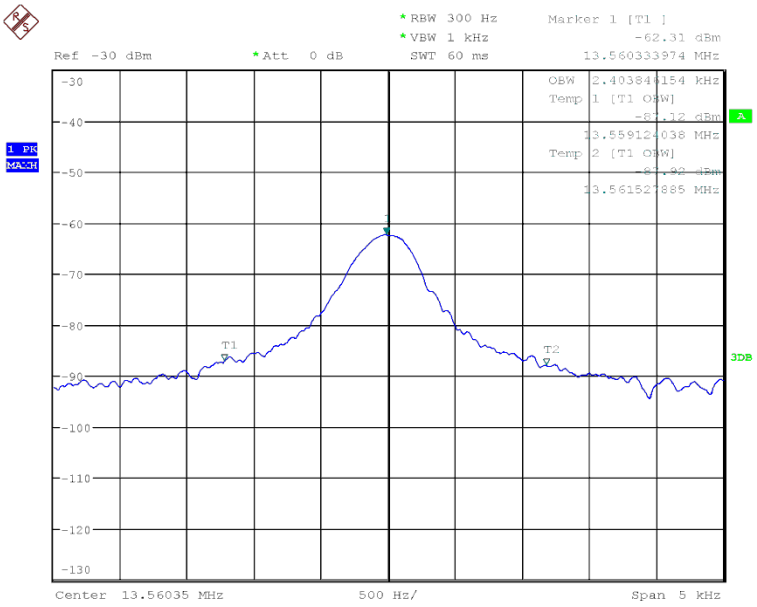
The testing was performed by Libass Thiaw on 2024-12-26 in 5m chamber 3.

8.6 Test Results

Frequency (MHz)	99% Bandwidth (kHz)	20dB Bandwidth (kHz)
13.56	2.404	1.530

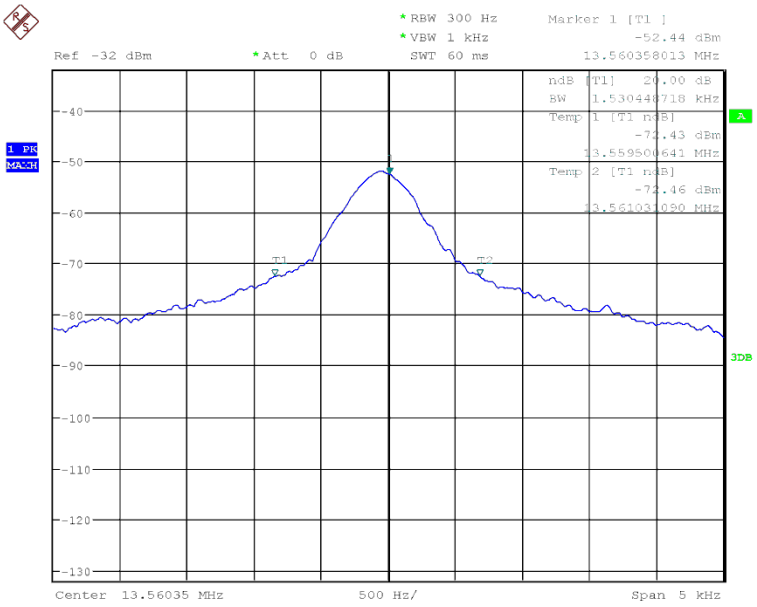
Please refer to the plots below for detailed test result.

99% Bandwidth: 2.404 kHz



Date: 26.DEC.2024 19:12:45

20 dB Bandwidth: 1.530 kHz



Date: 26.DEC.2024 15:26:37

9 Appendix A (Normative) – EUT Test Setup Photographs

Please refer to the attachment.

10 Appendix B (Normative) – EUT External Photographs

Please refer to the attachment

11 Appendix C (Normative) – EUT Internal Photographs

Please refer to the attachment

12 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

--- END OF REPORT ---