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CERTIFICATION TEST REPORT

Manufacturing Address:	Defibtech, L.L.C. 741 Boston Post Road, Suite 201 Guilford, Connecticut 06473 USA
Applicant:	Same as Above
Product Name:	DDU-2000 Series Automated External Defibrillator
Product Description:	Portable, battery-operated AED
Operating Voltage/Freq. of EUT During Testing:	Battery-powered only-12VDC non-rechargeable
Model(s):	DDU-2300*, DDU-2200, DDU-2400, DDU-2450 <i>*Denotes actual model tested as representative of DDU-2000 Series product family. Model differences represent rescue features. Manufacturer states that all models have the same hardware and base software. All models have the same transmitter and transmitter behavior.</i>
FCC ID:	WMRDFB-2000A
Testing Commenced:	2023-08-09
Testing Ended:	2023-08-14
Summary of Test Results:	In Compliance

The EUT complies with the EMC requirements when manufactured identically as the unit tested in this report, including any required modifications. Any changes to the design or build of this unit subsequent to this testing may deem it non-compliant.

Standards:

- ❖ **FEDERAL REGISTER CFR 47, PART 15 – RADIO FREQUENCY DEVICES**
 - **Part 15 Subpart C, Section 15.231 - Periodic operation in the band 40.66–40.70 MHz and above 70 MHz**
 - **Part 15 Subpart C, Section 15.209 - Radiated emissions limits; general requirements**
 - **Part 15 Subpart C, Section 15.35 - Measurement detector functions and bandwidths**
- ❖ **ANSI C63.4 2014 – American National Standard for Methods of Measurement of Radio-Noise Emissions from Low-Voltage Electrical and Electronic Equipment in the Range of 9 kHz to 40 GHz**



Order No(s): F2P28027A, F2P28027A-C1

Applicant: Defibtech, L.L.C.
Model: DSU-2300

Evaluation Conducted by:

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Report Reviewed by:

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1 ADMINISTRATIVE INFORMATION

1.1 Measurement Location:

F2 Labs in Middlefield, Ohio. Site description and attenuation data are on file with the FCC's Sampling and Measurement Branch at the FCC Laboratory in Columbia, MD.

1.2 Measurement Procedure:

All measurements were performed according to ANSI C63.4 and recommended FCC procedure of measurement under Section 15.231. A list of the measurement equipment can be found in Section 6.

1.3 Uncertainty Budget:

- Radiated Emissions
Combined Uncertainty (+ or -) 2.54 dB
Expanded Uncertainty (+ or -) 5.07 dB

This uncertainty represents an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2.

1.4 Document History

Document Number	Description	Issue Date	Approved By
F2P28027A-01E	First Issue	2023-09-05	K. Littell



2 SUMMARY OF TEST RESULTS

Standard(s)	Results
TRANSMITTER ON TIME - CFR 47 Part 15.231(a)(2)	Complies
FIELD SRENGTH OF EMISSIONS – CFR 47 Part 15.231(b); 15.209; C63.4, Section 13.7	Complies
OCCUPIED BANDWIDTH - CFR 47 Part 15.231(c)	Complies

Note: Requirements of 15.31 were met by using new batteries.

Test report reflects limited testing for a Class II Permissive Change.

Modifications Made to the Equipment
No modifications were made to the EUT



3 ENGINEERING STATEMENT

This report has been prepared on behalf of Defibtech, L.L.C., to provide documentation for the testing described herein. This equipment has been tested and found to comply with Part 15.231 of the FCC Rules, using ANSI C63.4 standards, with the modifications noted in Section 2 of this Test report. The test results found in this test report relate only to the items tested.



4 EUT INFORMATION AND DATA

4.1 Equipment Under Test:

Product: DDU-2000 Series Automated External Defibrillator

Model(s): DDU-2300*, DDU-2200, DDU-2400, DDU-2450

**Denotes actual model tested as representative of DDU-2000 Series product family. Model differences represent rescue features. Manufacturer states that all models have the same hardware and base software. All models have the same transmitter and transmitter behavior.*

Serial No.: 400122277

FCC ID: **WMRDFB-2000A**

4.2 Trade Name: Defibtech

4.3 Power Supply: Battery-powered only-12VDC non-rechargeable

4.4 Applicable Rules: CFR 47, Part 15.231, subpart C

4.5 Equipment Category: Intermittent Transmitter

4.6 Antenna: 0dBi integral antenna

4.7 Accessories:

Device	Manufacturer	Model Number	Serial Number
Battery	Defibtech, L.L.C.	DBP-2003	430181900

4.8 Test Item Condition: The equipment to be tested was received in good condition.

4.9 Testing Algorithm: The EUT was set to transmit a continuously modulated signal on the single frequency of 433.94 MHz.

**5 LIST OF MEASUREMENT INSTRUMENTATION**

Equipment Type	Asset Number	Manufacturer	Model	Serial Number	Calibration Due Date
Shielded Chamber	CL166-E	Albatross Projects	B83117-DF435-T261	US140023	2023-08-22
Antenna, JB3 Combination	CL175	Sunol Sciences	JB3	A030315	2023-09-22
Antenna, Horn	CL098	Emco	3115	9809-5580	2024-01-19
Pre-Amplifier	CL153	Agilent	83006-69007	MY57280115	2023-12-16
Receiver	CL151	Rohde & Schwarz	ESU40	100319	2024-04-10
Pre-Amplifier	CL282	Com-Power	PAM-103	18020111	2023-11-07
Active 18" Loop Antenna	CL163-Loop	A.H. Systems, Inc.	EHA-52B	100	2023-10-23
Software:	Tile Version 3.4.B.3		Software Verified: 2023-08-09 to 2023-08-14		
Software:	EMC 32, Version 8.53.0		Software Verified: 2023-08-09 to 2023-08-14		
Temp/Hum. Recorder	CL295	Thermpro	TP50	3	2024-04-27
Low Loss Cable	CL315	Fairview Microwave	FMC0202914-240	None Specified	2024-04-14
Low Loss Cable	CL319	Fairview Microwave	FMC0202914-12	None Specified	2024-04-14



6 TRANSMITTER ON TIME

6.1 Requirements:

A transmitter activated automatically shall cease transmission within 5 seconds after activation.

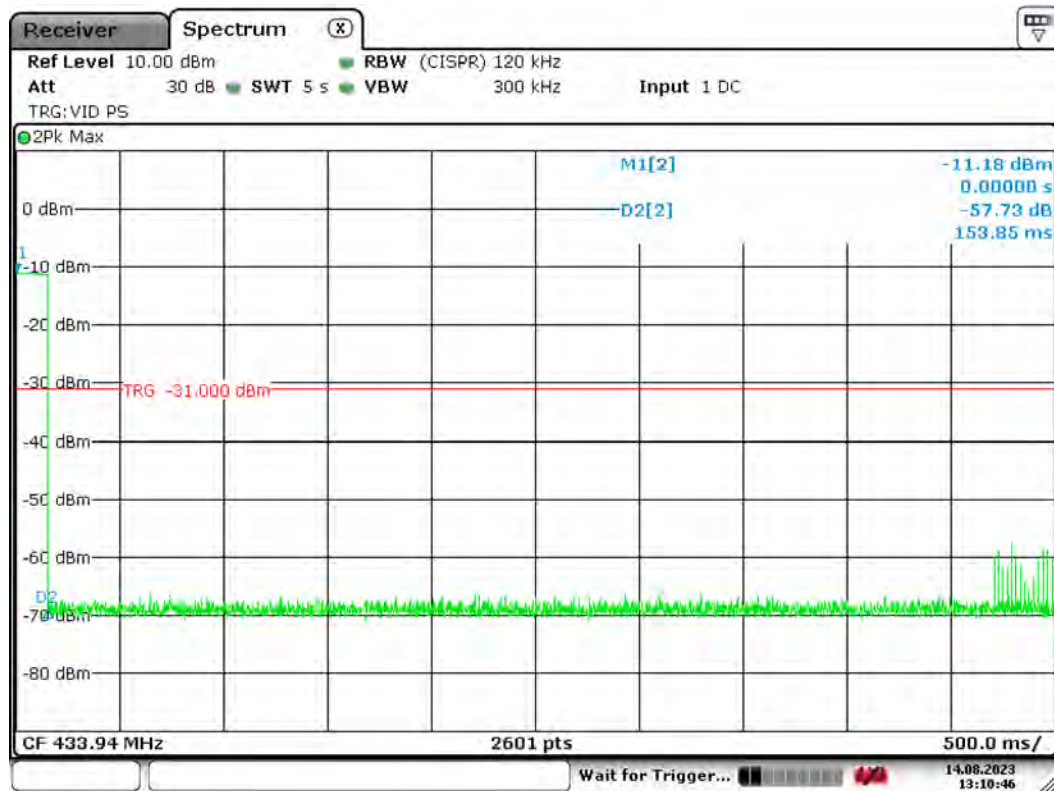


6.2 Test Data

Test Date:	2023-08-14	Test Engineers:	J. Chiller
Standards:	CFR 47 Part 15.231(a)(2)	Air Temperature:	22.4°C
		Relative Humidity:	46%

Test	Frequency: 433.94 MHz
On Time (s)	0.153

The following plot shows that the transmission ceased prior to 5 seconds after automatic activation.



Date: 14.AUG.2023 13:10:46



7.0 FIELD STRENGTH OF EMISSIONS

7.1 Requirements:

Field strength of emissions, fundamental and spurious using average detector and a peak limit of 20dB was added above the average limit per 15.35(b).

Limit range for fundamental frequencies between 260 MHz and 470 MHz is: 3,750-12,500 $\mu\text{V/m}$.

Limit range for spurious emissions for fundamentals between 260 MHz and 470 MHz is 375-1,250 $\mu\text{V/m}$ or the general limits in 15.209, whichever limit permits a higher field strength.

While the equipment was energized, the receiving antenna was scanned from 1.0 meter to 4.0 meters in both vertical and horizontal polarities while the turntable was adjusted 360 degrees to determine the maximum field strength.

The equipment was fully exercised with all cabling attached to the EUT and was positioned for maximum emissions.



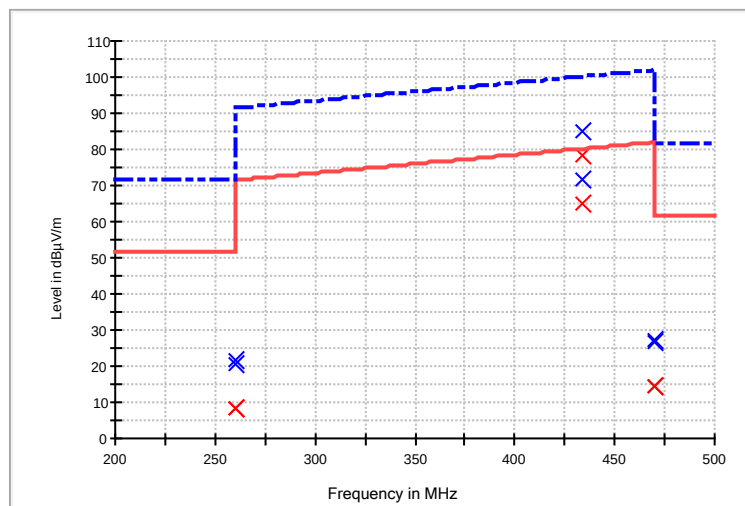
7.2 Test Data

Test Date:	2023-08-09	Test Engineers:	J. Chiller
Standards:	CFR 47 Part 15.231(b)(2); 15.209; C63.4, Section 13.7	Air Temperature:	22.1°C
		Relative Humidity:	42%

Test	433.94 MHz
Field Strength of Fundamental	78.5 dB μ V/m (8,400 μ V/m)
Limit for Fundamental	80.2 dB μ V/m (10,200 μ V/m)

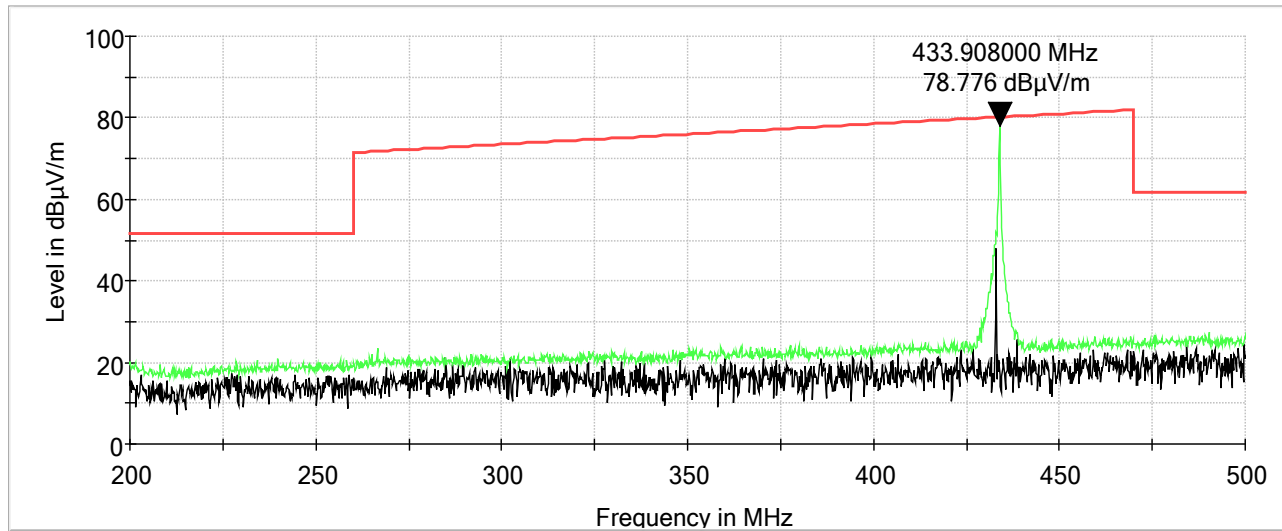
Band Edge Measurements

Frequency (MHz)	Polarity	Corr. (dB)	MaxPeak (dB μ V/m)	MaxPeak (dB μ V/m) Limit	MaxPeak Margin	Average (dB μ V/m)	Average (dB μ V/m) Limit	Average Margin	Bandwidth (kHz)
260.000000	H	-26.7	21.6	71.5	-49.9	8.5	51.5	-43.0	120.000
260.000000	V	-26.7	20.8	71.5	-50.7	8.6	71.5	-62.9	120.000
433.940000	H	-22.3	71.4	100.2	-28.8	65	80.2	-15.2	120.000
433.940000	V	-22.3	85	100.2	-15.2	78.5	80.2	-1.7	120.000
470.000000	H	-21.3	27.3	81.9	-54.6	14.5	61.9	-47.4	120.000
470.000000	V	-21.3	26.7	102.0	-75.3	14.5	82.0	-67.5	120.000

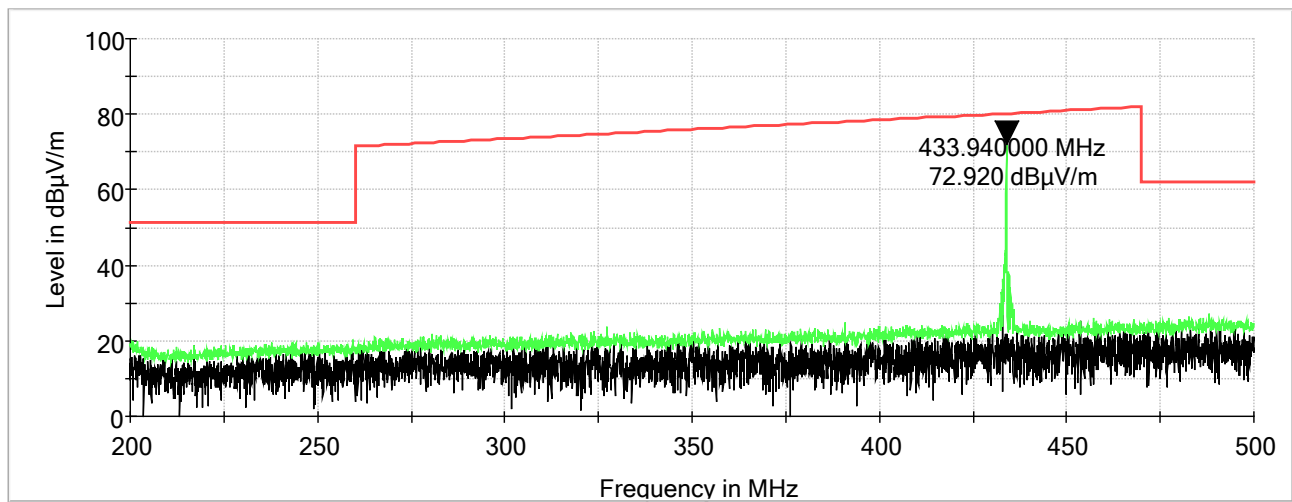




Characterization Scan: 200 MHz to 500 MHz, Vertical

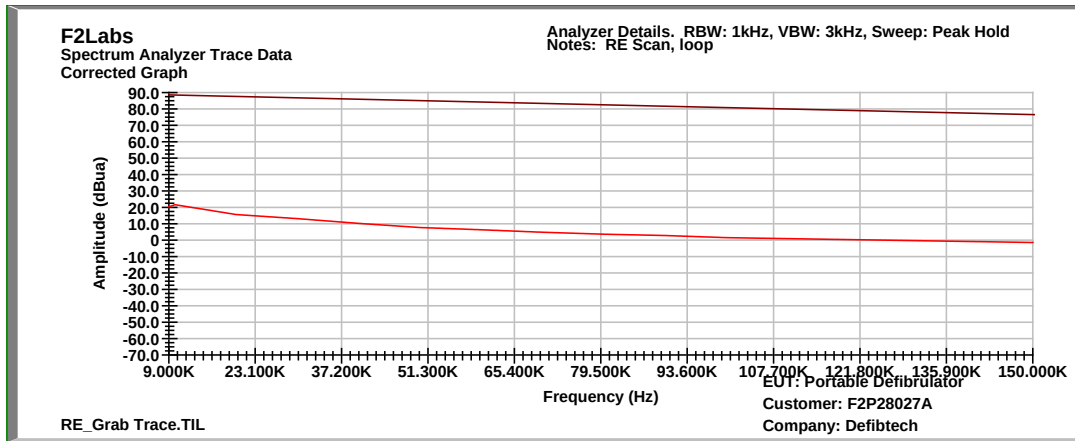


Characterization Scan: 200 MHz to 500 MHz, Horizontal

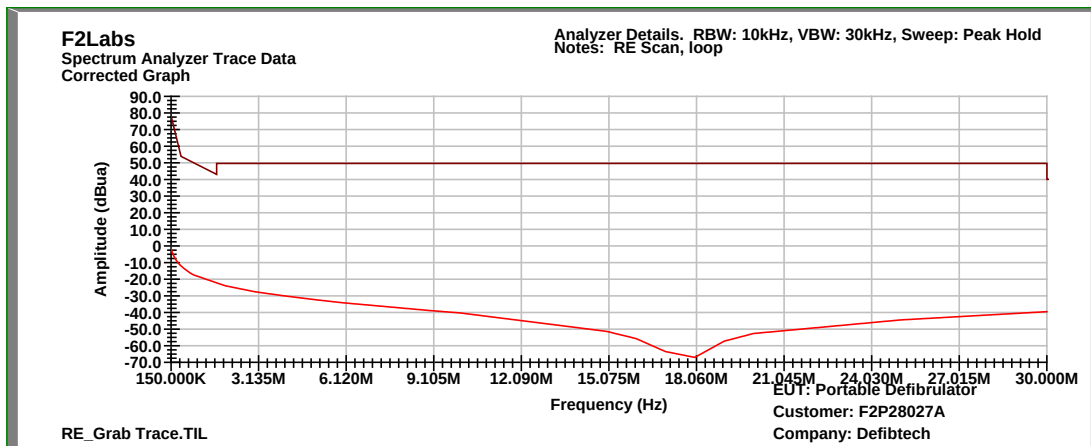




Characterization Scan, 0.009 MHz to 0.15 MHz (Loop)

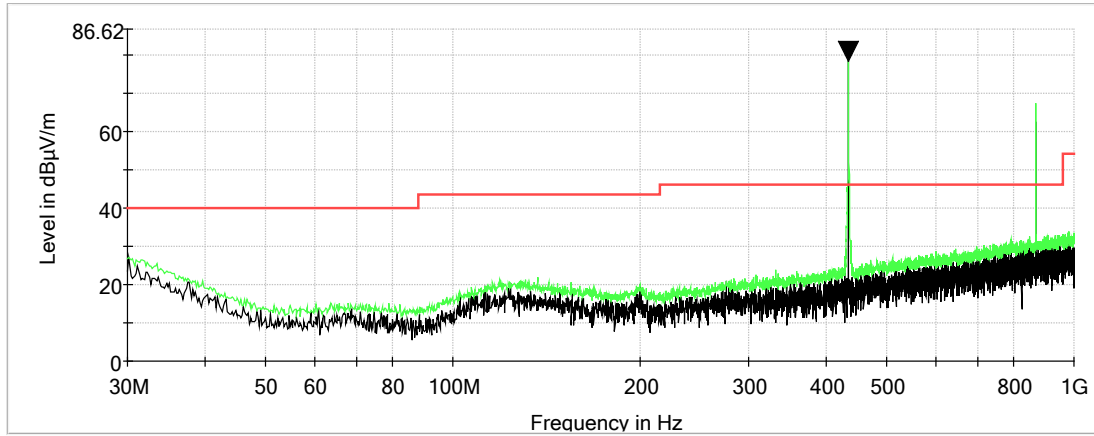


Characterization Scan, 0.15 MHz to 30 MHz (Loop)

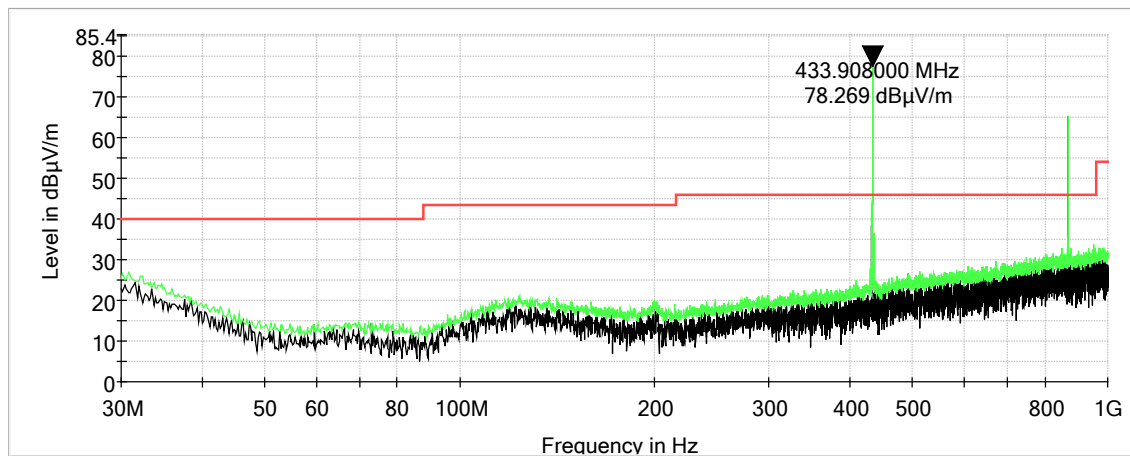




Characterization Scan, 30 MHz to 1000 MHz, Vertical

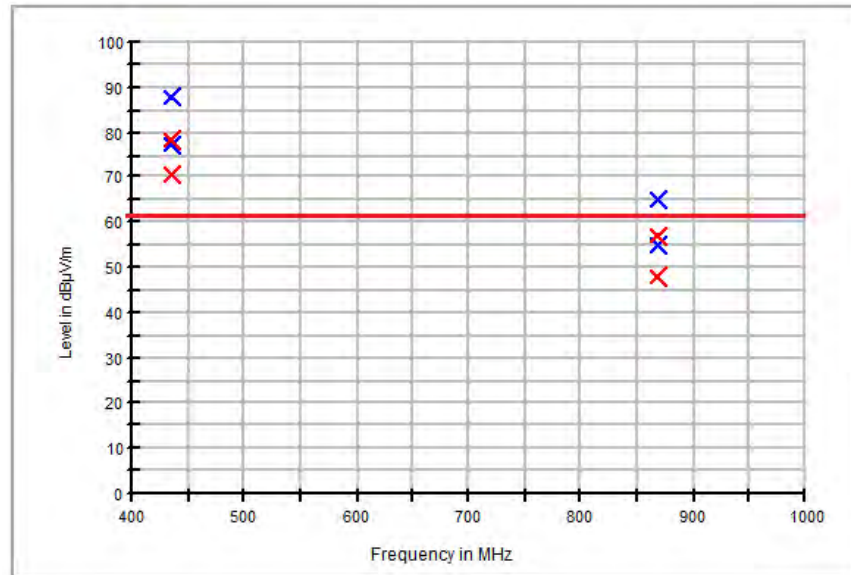


Characterization Scan, 30 MHz to 1000 MHz, Horizontal



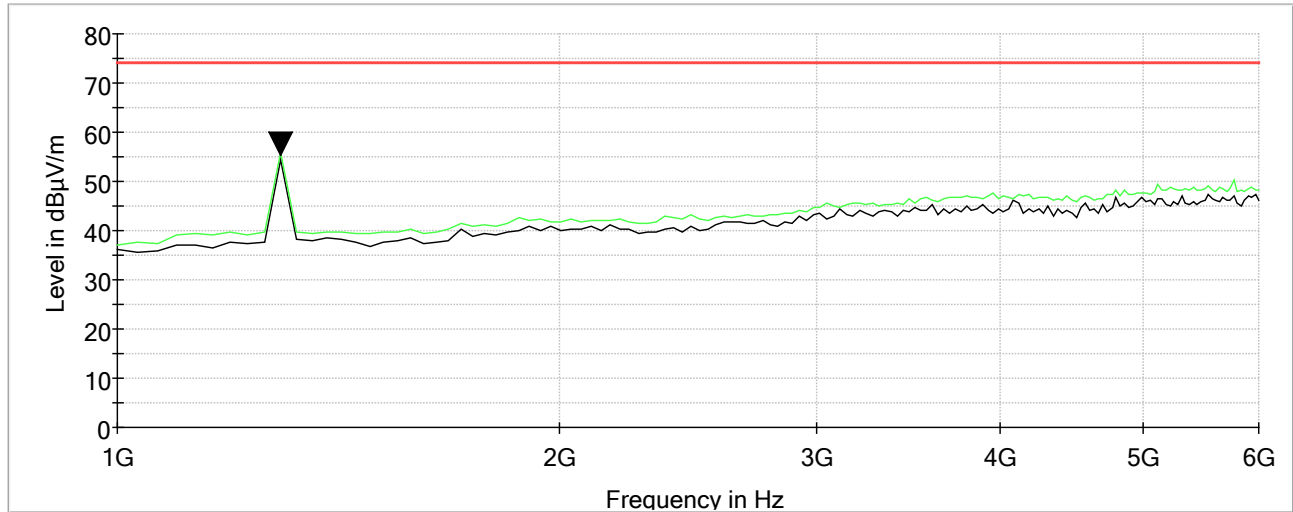
**Measurements: Second Harmonic**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Limit - AVG (dB μ V/m)
433.940000	87.7	78.5	120.000	110.0	V	113.0	-22.3	----
867.880000	65.2	57.1	120.000	110.0	V	113.0	-14.6	60.2
433.940000	77.1	70.6	120.000	308.0	H	180.0	-22.3	----
867.880000	55.1	47.9	120.000	308.0	H	180.0	-14.6	60.2

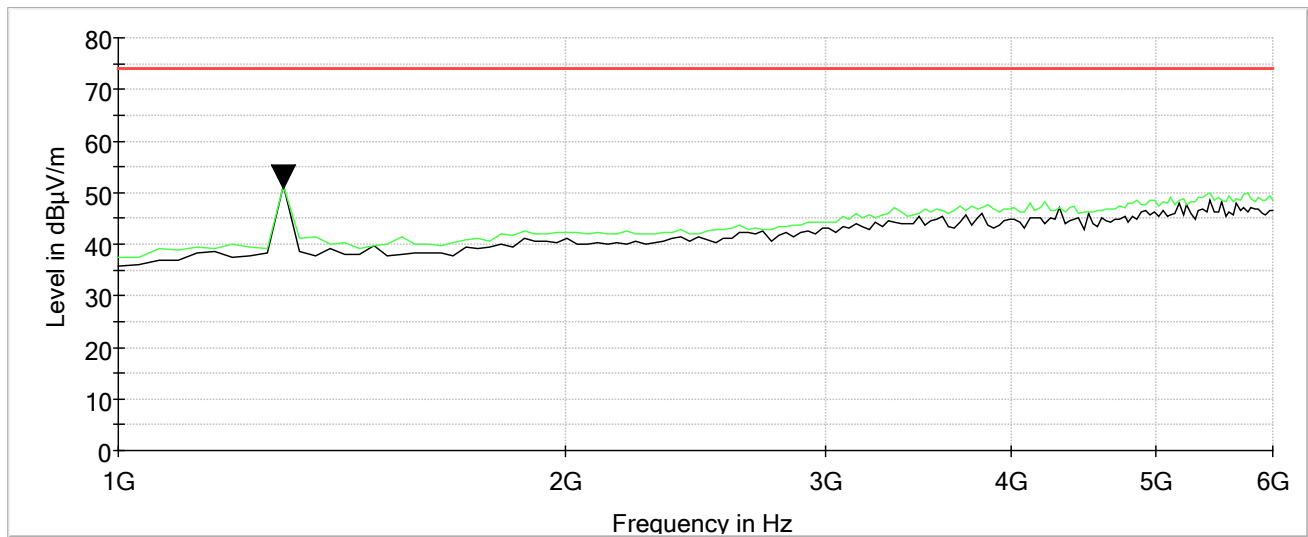




Characterization Scan: 1 GHz to 6 GHz, Vertical

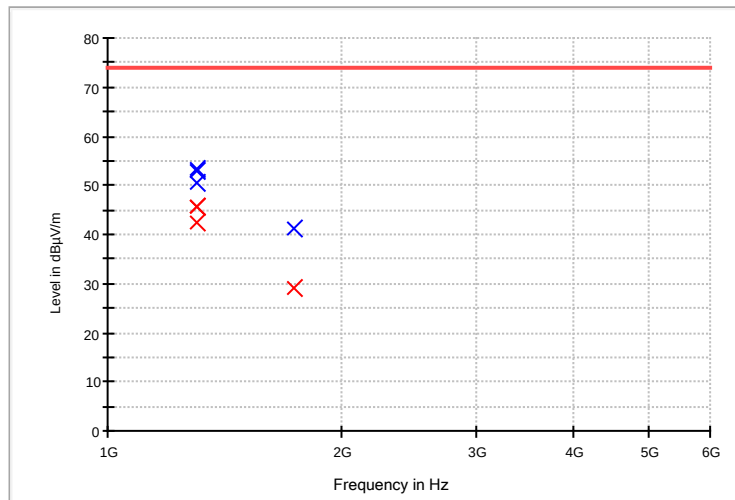


Characterization Scan: 1 GHz to 6 GHz, Horizontal



**Measurements: Harmonics Above 1 GHz**

Frequency (MHz)	MaxPeak (dB μ V/m)	Average (dB μ V/m)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Polarization	Azimuth (deg)	Corr. (dB)	Margin - AVG (dB)	Limit - AVG (dB μ V/m)
1302.000000	50.4	42.3	1000.0	1000.000	150.0	H	135.0	2.4	11.7	54.0
1302.000000	53.2	45.5	1000.0	1000.000	150.0	V	0.0	2.4	8.5	54.0
1736.000000	41.3	29.2	1000.0	1000.000	150.0	V	358.0	4.3	24.8	54.0





8 OCCUPIED BANDWIDTH

8.1 Requirements:

The bandwidth of the emission shall be no wider than 0.25% of the center frequency for devices operating above 70 MHz and below 900 MHz.

Limit at 433.92 MHz is 1.08 MHz.

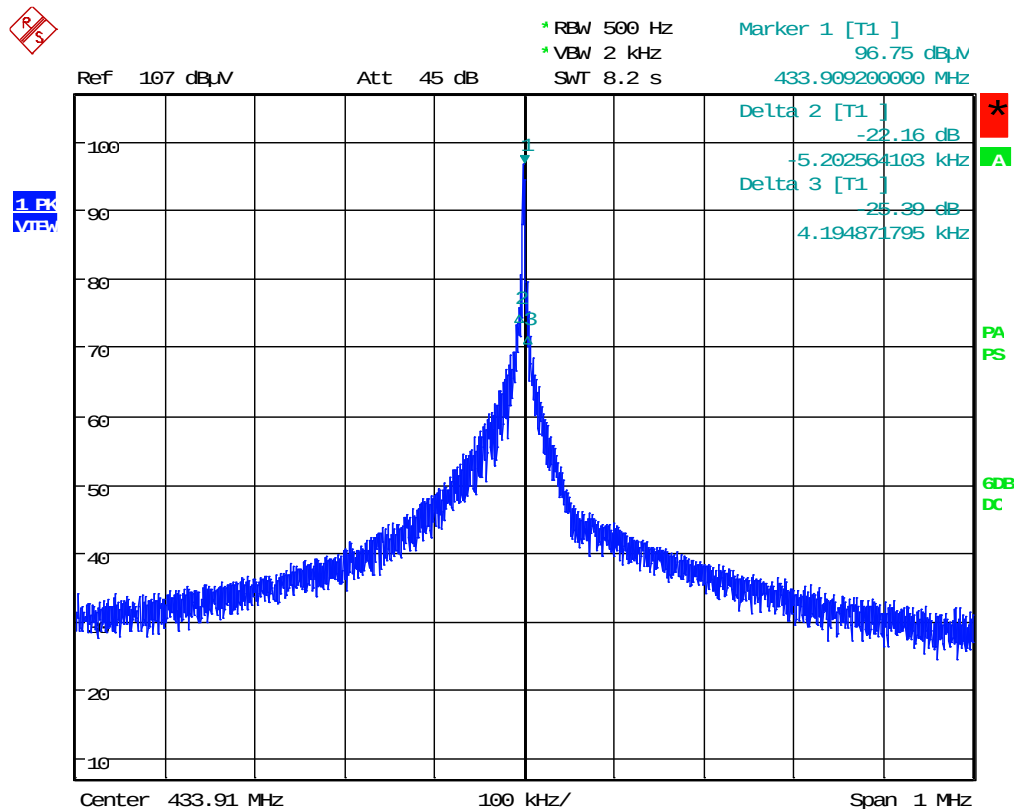


8.2 Test Data

Test Date:	2023-08-09	Test Engineer:	J. Chiller
Standard(s):	CFR 47 Part 15.231(c)	Air Temperature:	22.1°C
		Relative Humidity:	42%

Test	Frequency: 433.94 MHz
-20dB Occupied Bandwidth	9.396 kHz
99% Occupied Bandwidth	28.8 kHz

Note: Signal nature makes 1-5% RBW impossible.

-20dB

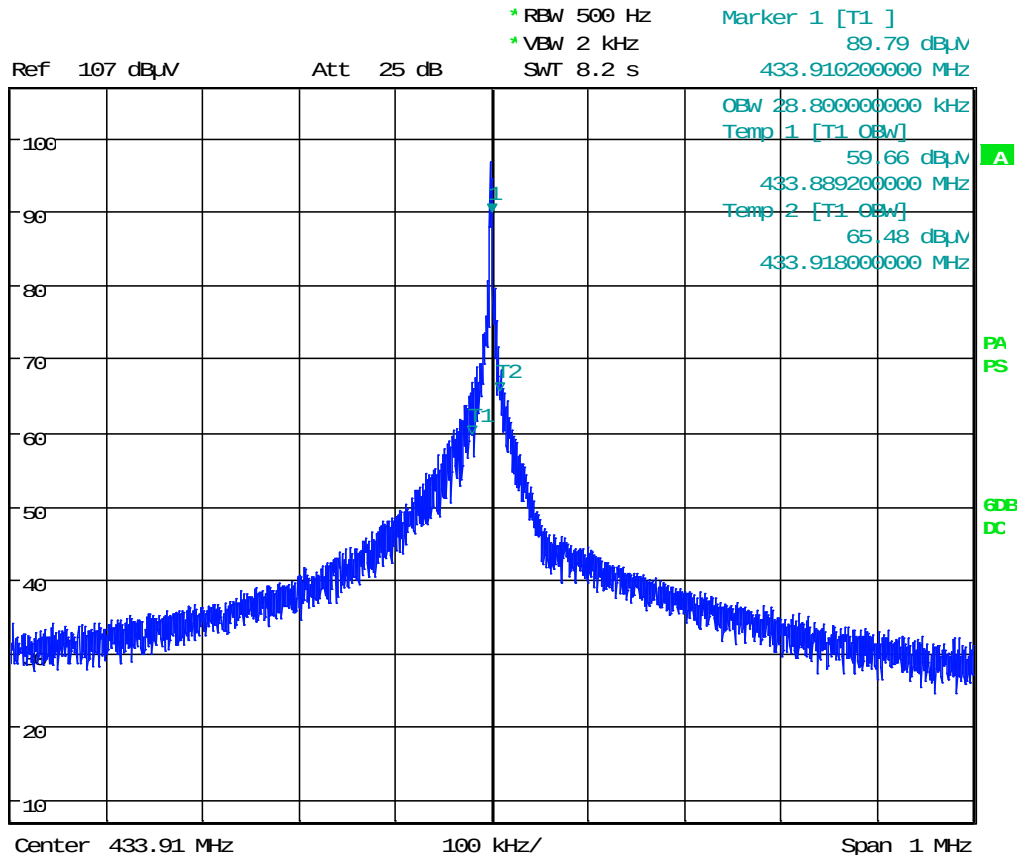
Date: 9.AUG.2023 16:07:28



99%



1.6k
VIEW



Date: 9.AUG.2023 16:06:52



9 TEST SETUP PHOTOGRAPHS

Radiated Spurious Emissions: Loop Antenna





**Radiated Spurious Emissions: 30 MHz to 1000 MHz
Field Strength, Occupied Bandwidth, Transmit on Time**



Radiated Spurious Emissions: Greater Than 1 GHz

