



Test Report - FCC Part 90 C2PC

Applicant: goTenna Inc.

Signature:

A handwritten signature in black ink, appearing to read "Tim Royer".

Sr. EMC Engineer
EMC-003838-NE



Name & Title:

Tim Royer, EMC Engineer

Date of Signature

6/3/2024

Signature:

A handwritten signature in black ink, appearing to read "Kristoffer Costa".

Name & Title:

Kristoffer Costa, EMC Technician

Date of Signature

6/3/2024

This test report relates only to the items tested as identified and is not valid for any subsequent changes or modifications made to the equipment under test.

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1. Applicant Information

Applicant: goTenna Inc.
Address: 101 Hudson Street
Suite 1701
Jersey City, New Jersey, 07302, United States

1.1 Part 90 Test Result Summary

The following test procedure and guidance were used for measuring FCC PART 90 (PRIVATE LAND MOBILE RADIO SERVICES) known as Licensed Land Mobile; ANSI C63.26-2015. Full test results are available in this report.

Applicable Clauses from Part 2		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
2.202	Bandwidth & Emission	Pass
2.1033 (c)(8)	Power at the Final Amplifier	N/A
2.1046 (a)	RF Output Power	Pass
2.1047	Modulation characteristics	N/A
2.1049	Occupied Bandwidth	Pass
2.1051	Spurious emissions at antenna terminals	Pass
2.1053	Field strength of spurious radiation	N/A
2.1055	Frequency stability	N/A

Applicable Clauses from Part 90		
FCC Clauses	Description of the requirements	Result: (Pass, Fail, N/A)
90.205 (r)	Transmitter Power	Pass
90.207 (n)	Emission designator	Reported
90.209 (b) (5) footnote 2	Bandwidth limitations	Pass
90.210 (n)	Emission masks, In-band	N/A
90.210 (n)	Emission masks, Out-of-band	N/A
90.213 (a) footnote 10	Frequency stability	N/A
90.214	Transient Frequency Behavior	N/A
90.221	Adjacent channel power limits	N/A

No additions to the test methods were needed. There were no deviations, or exclusions from the test methods. No test results are from external providers or from the customer. The test results relate only to the items tested. Timco does not offer opinions and interpretations, only a pass/fail statement.

2. Location of Testing

2.1 Test Laboratory

Timco Engineering Inc. is a subsidiary of Industrial Inspection & Analysis, Inc. ("IIA"). Testing was performed at IIA's permanent laboratory located at 13146 NW 86th Drive, Suite 400, Alachua, Florida 32615.

FCC test firm # 578780

FCC Designation # US1070

FCC site registration is under A2LA certificate # 0955.01

ISED Canada test site registration # 2056A

EU Notified Body # 1177

For all designations see A2LA scope # 0955.01

2.2 Testing was performed, reviewed by

Dates of Testing: 3/14/2024 – 3/15/2024

Signature:



Sr. EMC Engineer
EMC-003838-NE



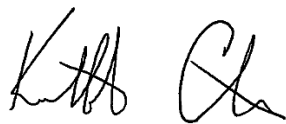
Name & Title:

Tim Royer, EMC Engineer

Date of Signature

5/22/2024

Signature:



Name & Title:

Kristoffer Costa, EMC Technician

Date of Signature

5/22/2024

3. Test Sample(s) (EUT/DUT)

The test sample was received: 3/12/2024

3.1 Description of the EUT

A description as well as unambiguous identification of the EUT(s) tested. Where more than one sample is required for technical reasons (such as the use of connected units for the purpose of conducted output power testing where the product units will have integral antennas), each specific test shall identify which unit was tested.

Identification	
FCC ID:	2ABVK373372
Brief Description	Mobile Mesh Networking Device
Model(s) #	N/A
Firmware version	N/A
Software version	N/A
Serial Number	N/A

Technical Characteristics	
Frequency Range	380 MHz- 450 MHz
RF O/P Power (Max.)	5W
Modulation	FM
Bandwidth & Emission Class	F1D
Antenna Connector	SMA
Voltage Rating (AC or Batt.)	Battery

Antenna Characteristics			
Antenna	Frequency Range	Mode / BW	Antenna Gain
1	n/a	n/a	0 dBi

- Note: Information such as antenna gain, firmware/software numbers are provided by manufacturer and cannot be validated by the test lab.

3.2 Configuration of EUT

Test Modes				
Mode (#)	Mode (Type)	Test Frequencies (MHz)	BW (nominal) (kHz)	Emission Designator
1	Transmit	420 MHz 445 MHz	7.83	F1D
1	Transmit	420 MHz 445 MHz	11.204	F1D

Operating conditions during Testing:

The device was operated without the provided antenna(s).

No other modifications of the device under test (including firmware, specific software settings, and input/output signal levels to the EUT) were made.

Peripherals used during Testing:

A laptop was used to program the EUT.

3.3 Test Setup of EUT

Equipment, antenna, and cable arrangement. The setup of the equipment and cable or wire placement on the test site that produces the highest radiated and the highest ac power line conducted emissions shall be shown clearly and described. Information on the orientation of portable equipment during testing shall be included. Drawings or photographs may be used for this purpose.

Test Setups are included in the test report.

4. Test methods & Applicable Regulatory Limits

4.1 Test methods/Standards/Guidance:

Test procedures and guidance for measuring Licensed Part 90 Licensed device:

- 1) ANSI C63.26-2015

4.2 Applied Limits and Regulatory Limits:

- 1) FCC CFR 47 Part 90 (2007)

5. Measurement Uncertainty

Parameter	Uncertainty (dB)
Conducted Emissions	± 3.14 dB
Radiated Emissions (9kHz – 30 MHz)	± 3.08 dB
Radiated Emissions (30 – 200 MHz)	± 2.16 dB
Radiated Emissions (200 – 1000 MHz)	± 2.15 dB
Radiated Emissions (1 GHz – 18 GHz)	± 2.14 dB
Radiated Emissions (18 GHz – 40 GHz)	± 2.31 dB
Note: The uncertainties provided in this table represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of K=2.	

6. Environmental Conditions

6.1 Temperature & Humidity

Measurements performed at the test site did not exceed the following:

Parameter	Measurement
Temperature	23 C +/- 5%
Humidity	55% +/- 5%
Barometric Pressure	30.05 in Hg
Note: Specific environmental conditions that are applicable to a specific test are available in the test result section.	

7. List of Test Equipment and Test Facility

The test equipment used identified by type, manufacturer, serial number, or other identification and the date on which the next calibration or service check is due.

Description of the firmware or software used to operate EUT for testing purposes.

A complete list of all test equipment used shall be included with the test report. The manufacturer's model and serial numbers, and date of last calibration, and calibration interval shall be included. Measurement cable loss, measuring instrument bandwidth and detector function, video bandwidth, if appropriate, and antenna factors shall also be included where applicable.

7.1 List of Test Equipment

Test Equipment						
Type	Device	Manufacturer	Model	SN#	Current Cal	Cal Due
Antenna, NSA	Log-Periodic 1243	Eaton	96005	1243	5/4/21	5/3/2024
Antenna	Double-Ridged Horn/ETS Horn 1	ETS-Lindgren	3117	00035923	5/31/23	5/30/2026
CHAMBER	CHAMBER	Panashield	3M	N/A	12/29/23	12/18/2025
Pre-amp	Pre-amp	RF-LAMBDA	RLNA00M45GA	NA	2/27/22	7/26/2025
Receiver	EMI Test Receiver R&S ESU 40	Rohde & Schwarz	ESU 40	100320	5/27/21	5/26/2024
Receiver	EMI Test Receiver R&S ESW44	Rohde & Schwarz	ESW44	103049	10/13/21	10/12/2024
Signal Generator	Signal Generator HP 8648C	HP	8648C	35537A01679	8/4/22	8/03/2025

Software			
Software	Author	Version	Validation on
ESU Firmware	Rohde & Schwarz	4.43 SP3; BIOS v5.1-24-3	2018
RSCCommander	Rohde & Schwarz	1.6.4	2014
ScopeExplorer	LeCroy	v2.25.0.0	2009
Field Strength	Timco	v4.10.7.0	2016

8. Test Results

The results of the test are usually indicated in the form of tables, spectrum analyzer plots, charts, sample calculations, as appropriate for each test procedure.

A description and/or a block diagram of the test setup is usually provided.

The measurement results, along with the appropriate limits for comparison, may be presented in tabular or graphical form. In addition, any variation in the measurement environment may be reported if applicable (e.g., a significant change of temperature that could affect the cable loss and amplifier response).

Unless noted otherwise in the referenced standard, the measurements of **ac power-line conducted emissions and conducted power output** will be reported in units of dB μ V. Unless noted otherwise in the referenced standard, the measurements of **radiated emissions** will be reported in units of decibels, referenced to one microvolt per meter (dB μ V/m) for electric fields, or to one ampere per meter (dBA/m) for magnetic fields, at the distance specified in the appropriate standards or requirements. The measurements of antenna-conducted power for receivers may be reported in units of dB μ V if the impedance of the measuring instrument is also reported. Otherwise, antenna-conducted power will be reported in units of decibels referenced to one milliwatt (dBm). All formulas for data conversions and conversion factors, if used, will be included in this measurement report.

Example:

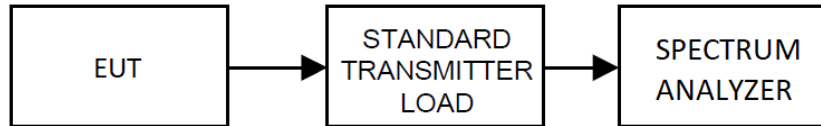
Freq (MHz)	Meter Reading	+ ACF	+CL	= FS
33	20 dB μ V	+ 10.36 dB/m	+0.40 dB	=30.36 dB μ V/m @ 3m

$EIRP = P_{cond} \text{ (dBm)} + dBi$

8.1 RF Output Power

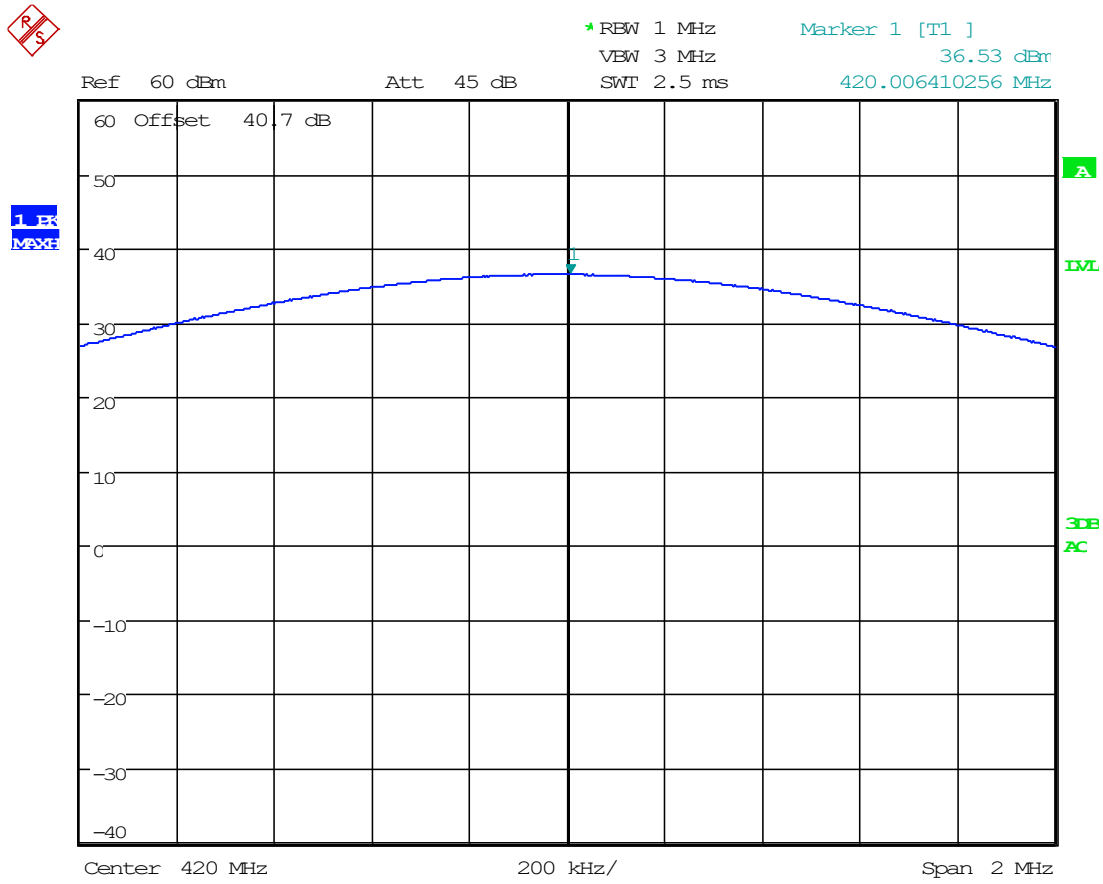
Limits from FCC Parts 2.1046(a), and 90.205 (r); and test procedure from ANSI C63.26-2015.

Test Setup



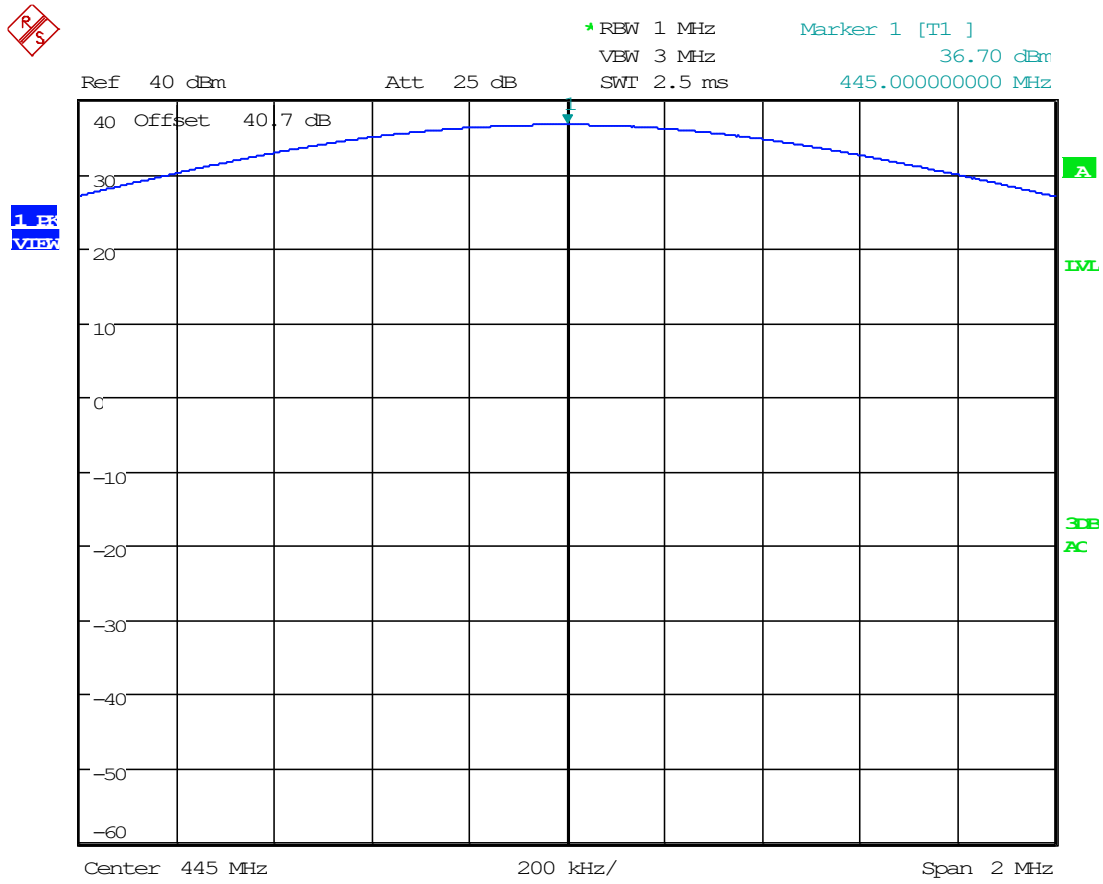
Test Results, Mode 1		
Tuned Frequency (MHz)	Power Output (dBm)	Power Output (W)
420	36.53	4.497
445	36.70	4.677

8.1.1 RF Power Output Plot, 420 MHz



Date: 17.MAY.2024 15:15:55

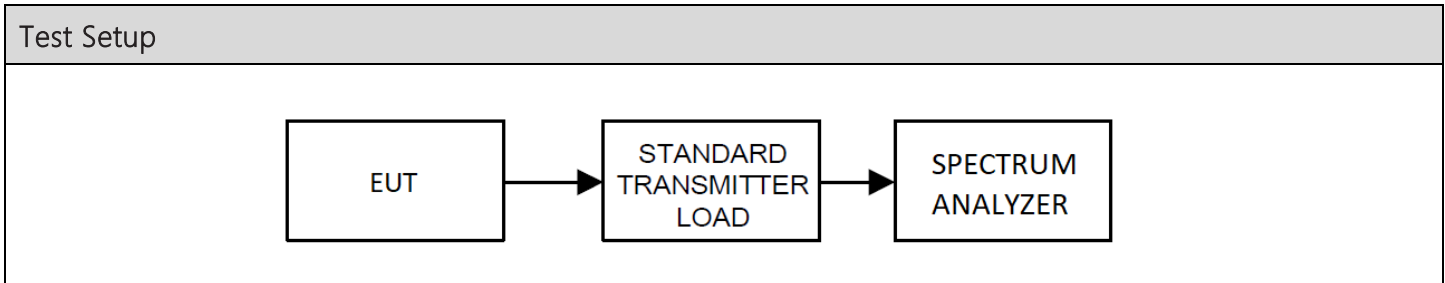
8.1.2 RF Power Output Plot, 445 MHz



Date: 20.MAY.2024 14:54:21

8.2 Bandwidth & Emission

Limits from FCC Parts 2.1049, and 90.207 & 90.209, and test procedure from ANSI C63.26-2015.

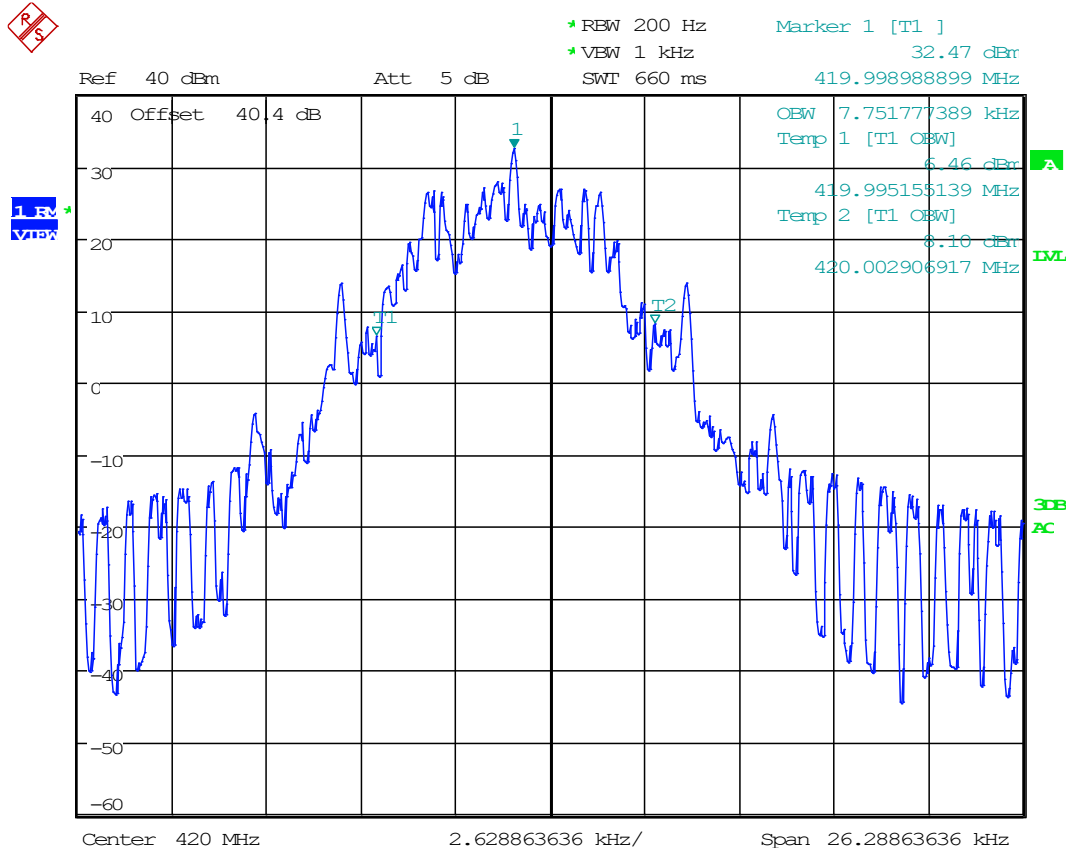


a

Test Results, Occupied Bandwidth				
Tuned Frequency (MHz)	Mode	Emission Designator	Occupied Bandwidth (kHz)	Bandwidth Type
420	1	F1D	7.751	99%
445	1	F1D	7.833	99%
420	1	F1D	11.204	99%
445	1	F1D	11.190	99%

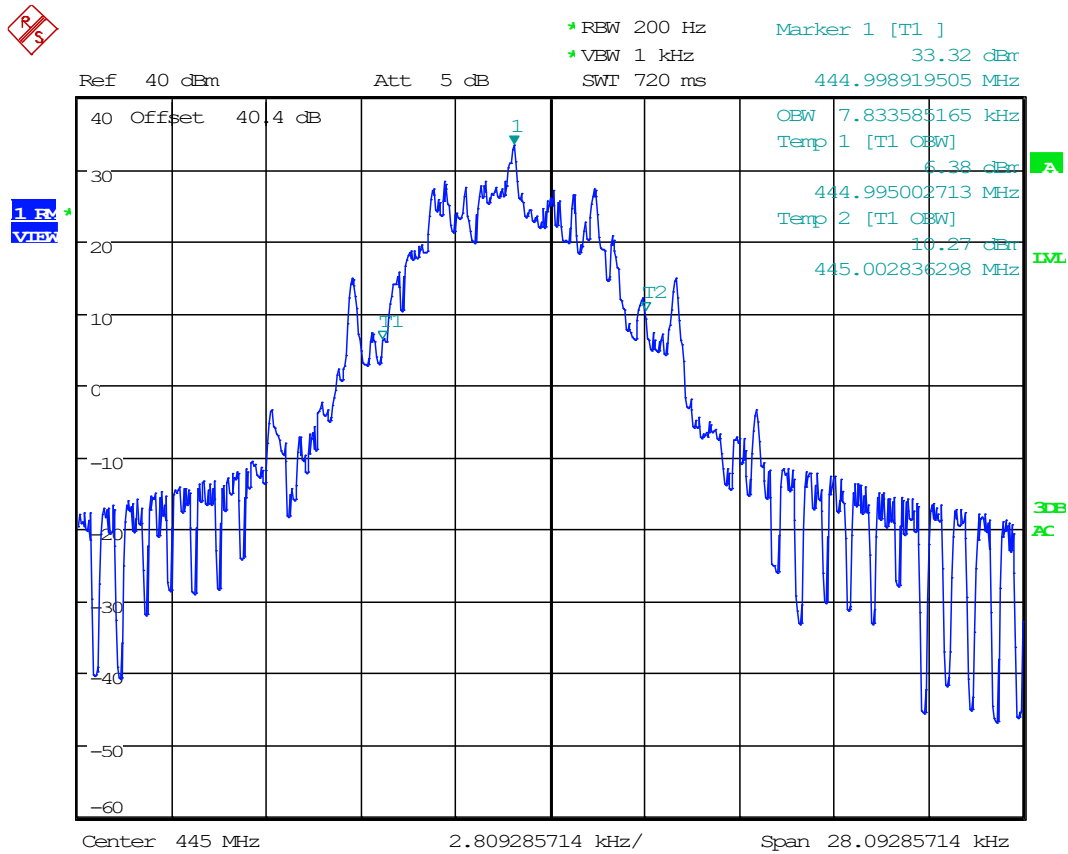
Occupied Bandwidth, Spectrum Plots

8.2.1 99% Bandwidth Plot, 7K, 420 MHz



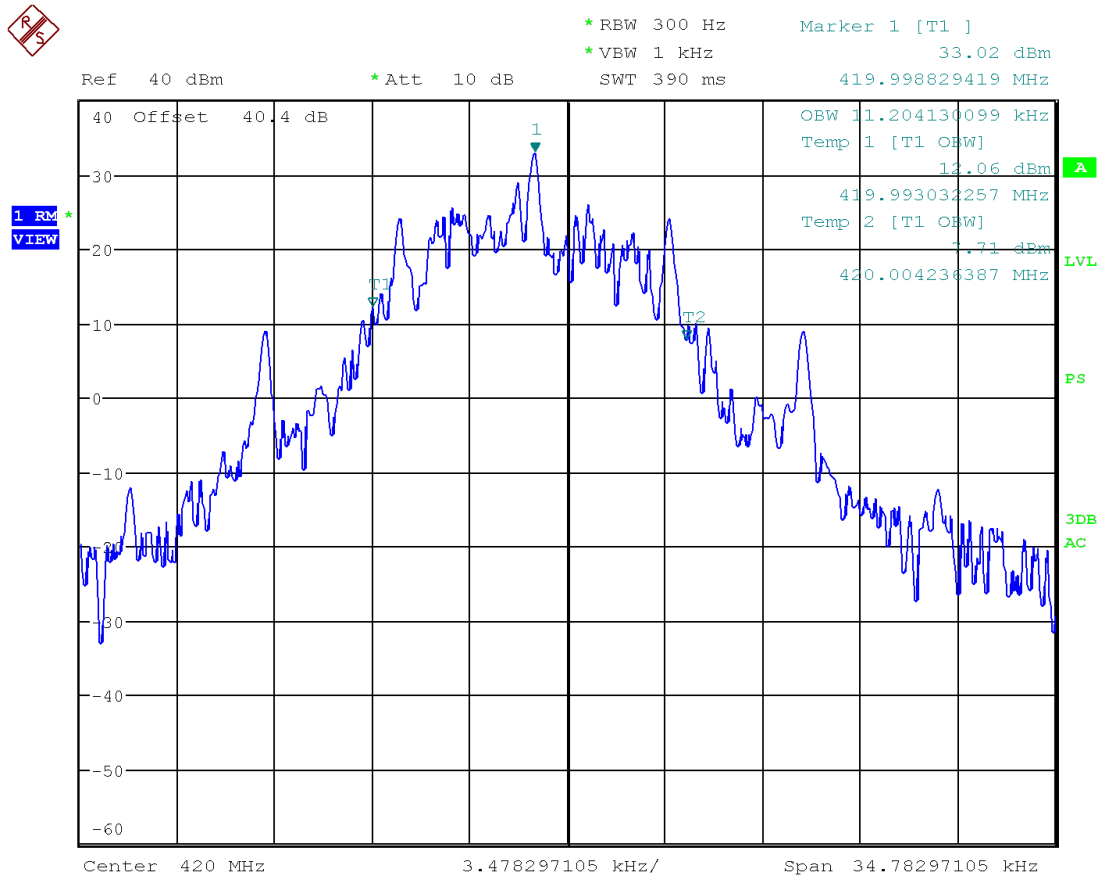
Date: 18.MAR.2024 11:30:20

8.2.2 99% Bandwidth Plot, 7k, 445 MHz



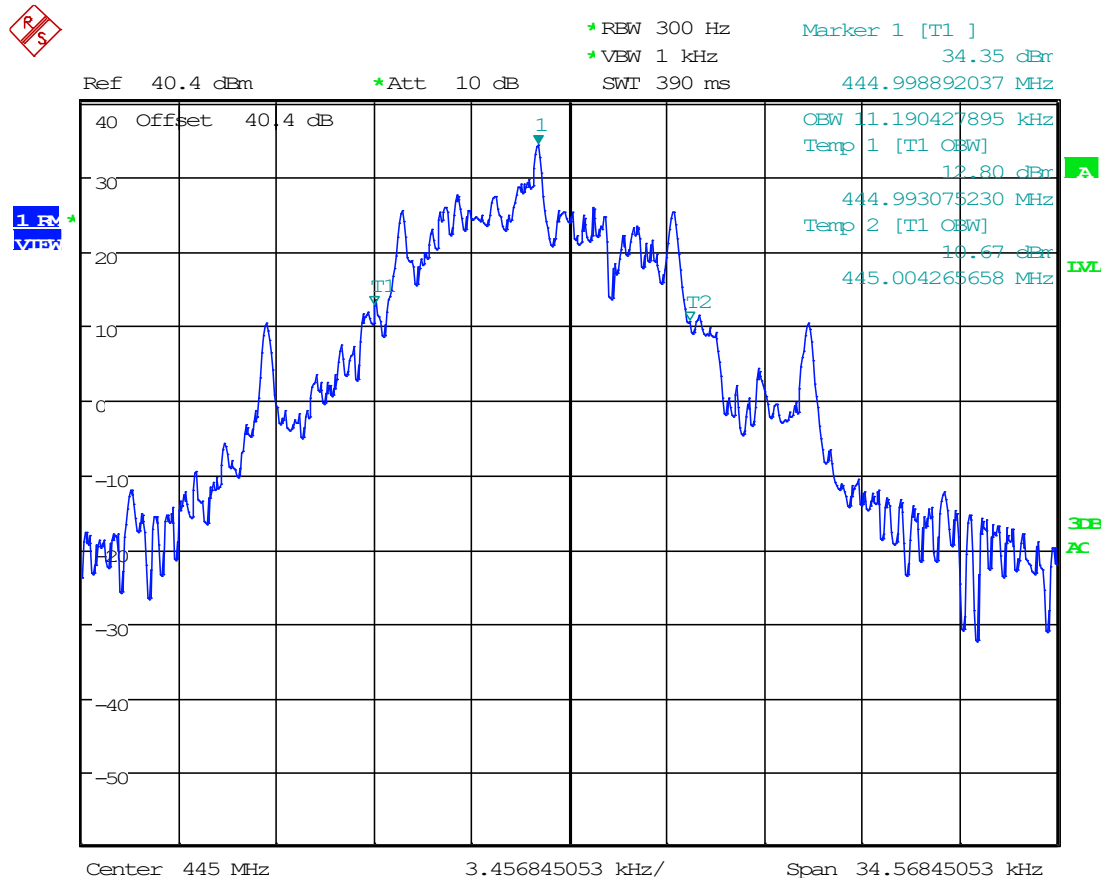
Date: 18.MAR.2024 11:35:10

8.2.3 99% Bandwidth Plot, 11k, 420 MHz



Date: 15.MAR.2024 11:21:20

8.2.4 99% Bandwidth Plot, 11k, 445 MHz

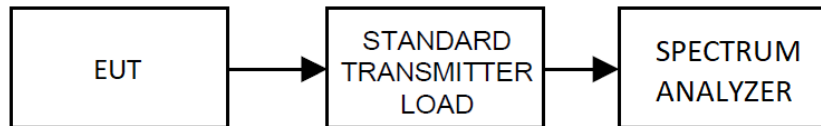


Date: 15.MAR.2024 15:48:06

8.3 Emission Limitations, Out-of-Band

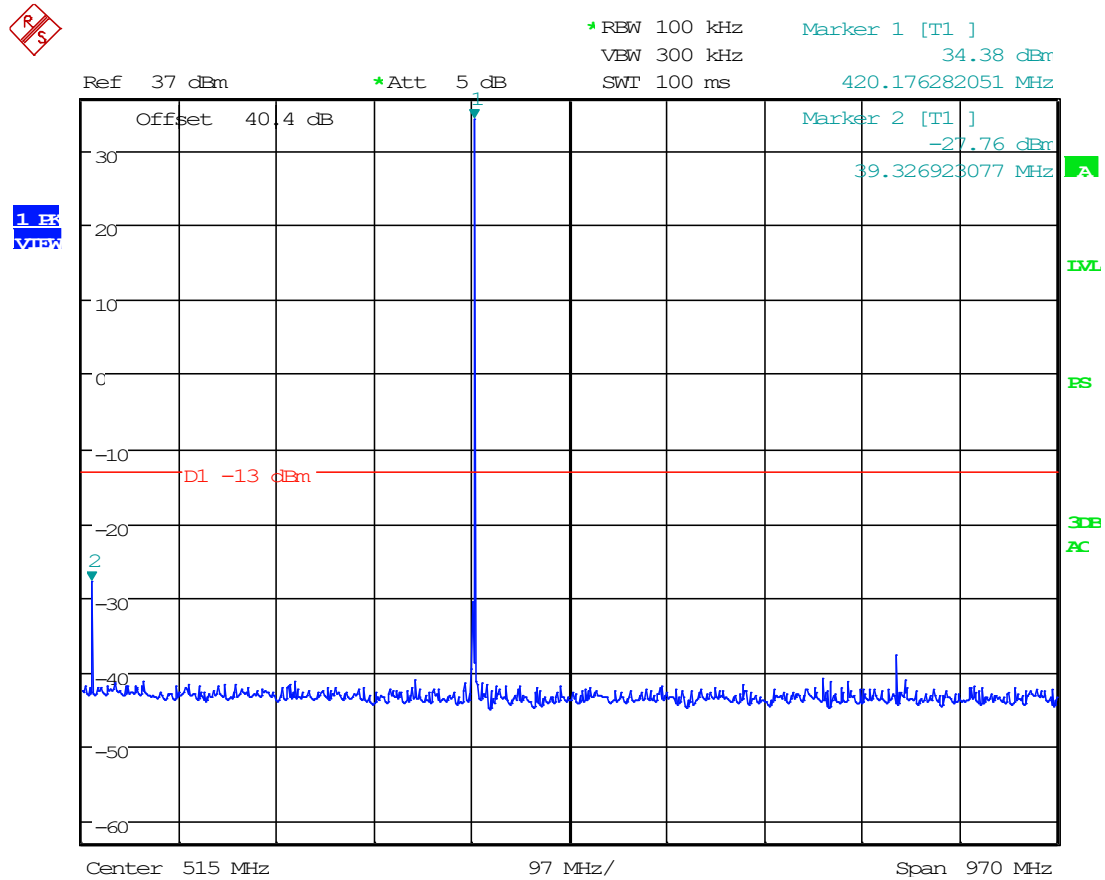
Limits from FCC Parts 2.1051, and 90.210; and test procedure from ANSI C63.26-2015.

Conducted Test Setup



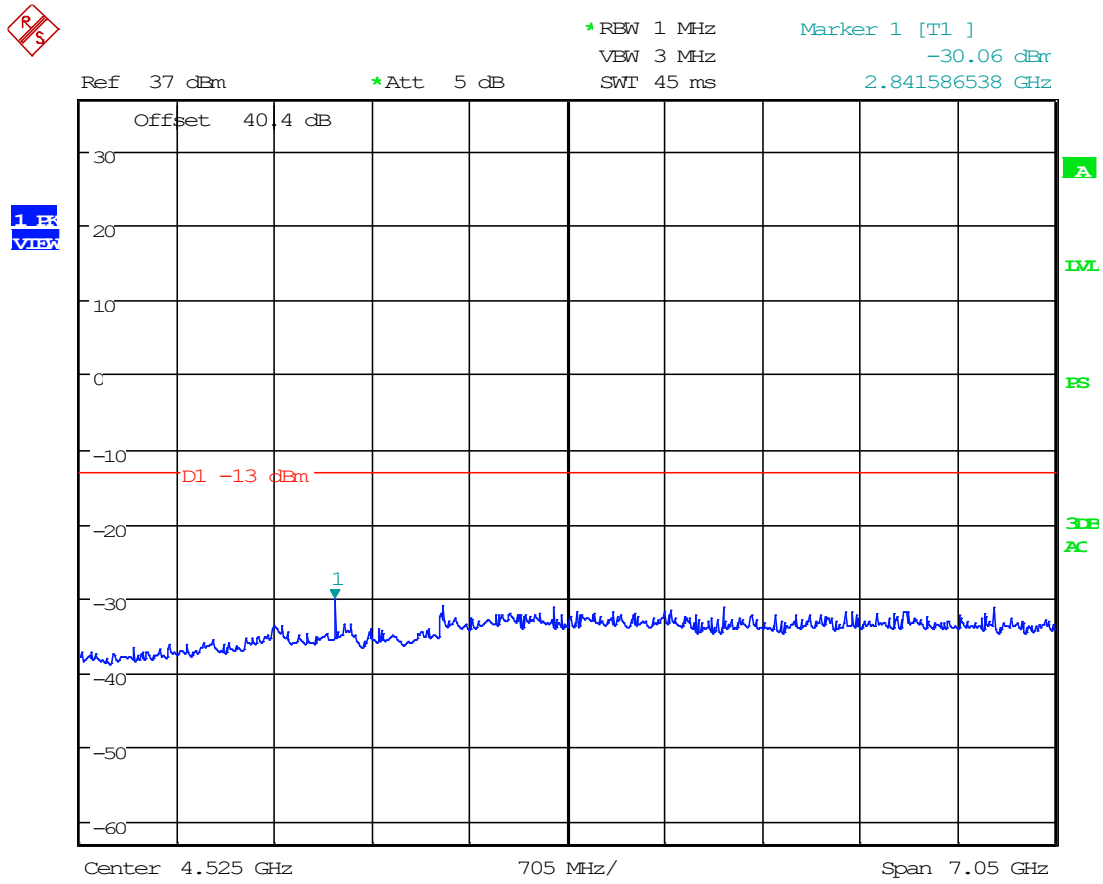
Conducted Emissions Spectrum Plots

8.3.1 Conducted Emissions, Below 1GHz, 420 MHz



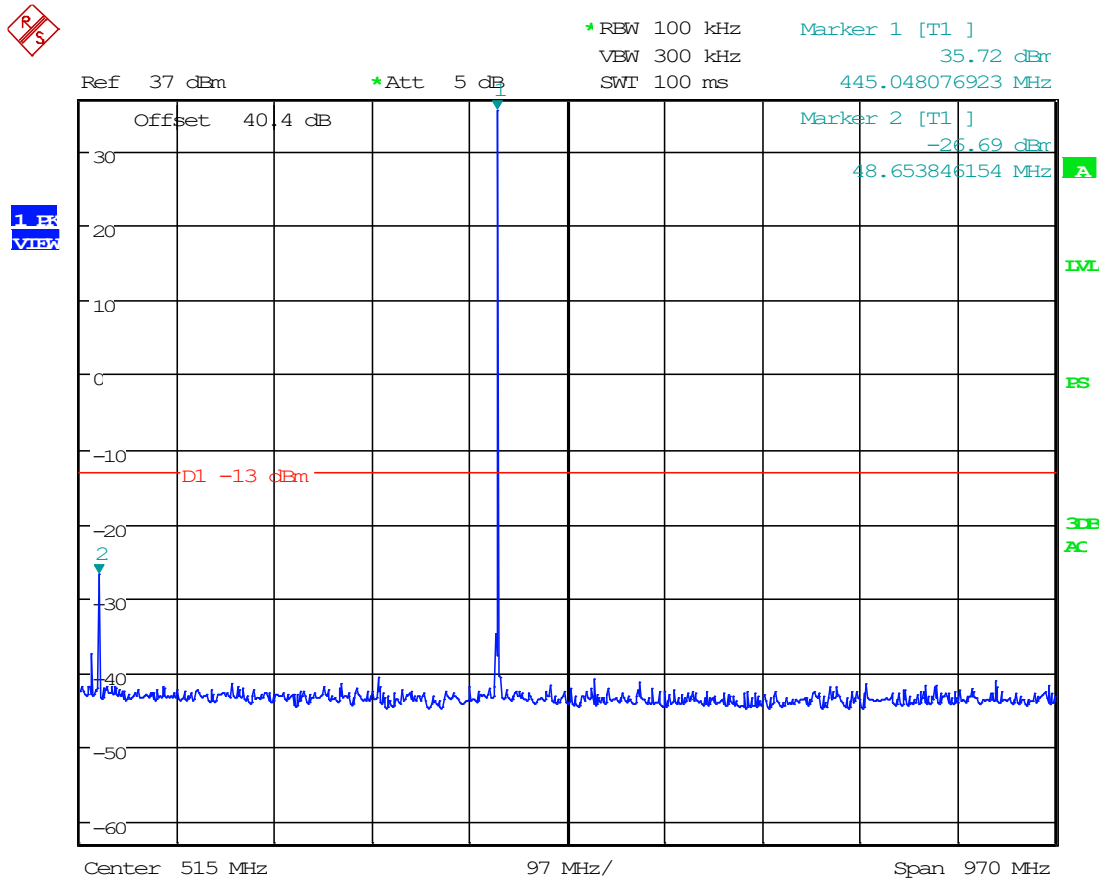
Date: 15.MAR.2024 11:33:22

8.3.2 Conducted Emissions Above 1GHz, 420 MHz



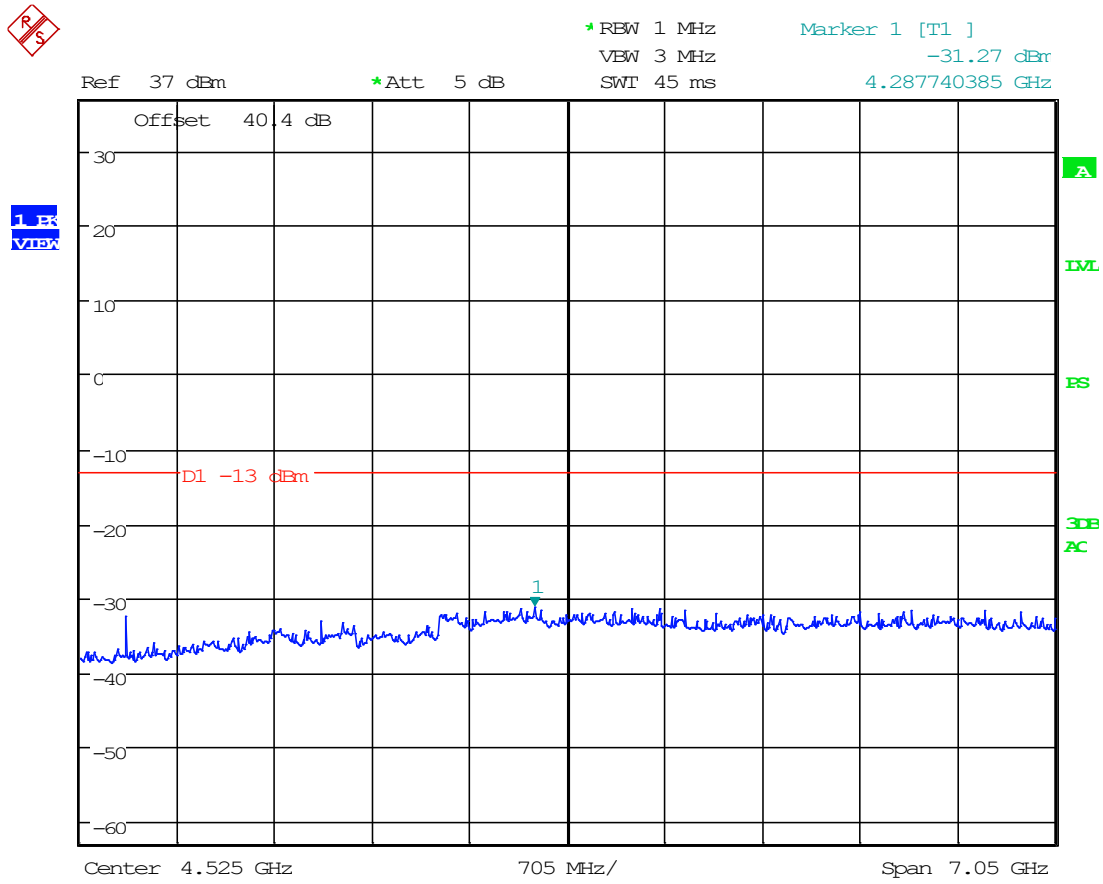
Date: 15.MAR.2024 11:34:13

8.3.3 Conducted Emissions Below 1GHz, 445 MHz



Date: 15.MAR.2024 15:51:12

8.3.4 Conducted Emissions Above 1GHz, 445 MHz

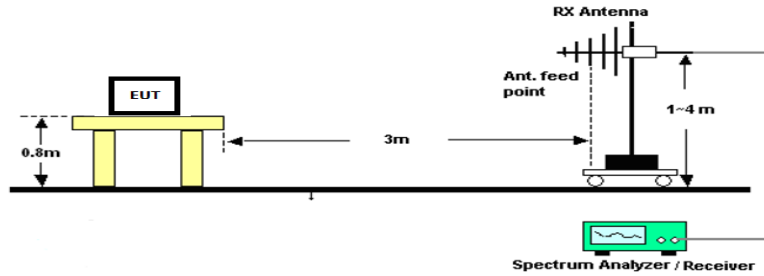


Date: 15.MAR.2024 15:52:04

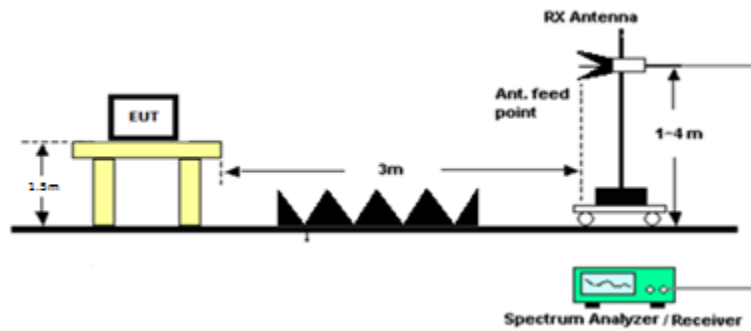
8.4 Radiated Emissions

Limits from FCC Parts 2.1053 and 90.210 (n); and test procedure from ANSI C63.26-2015.

Radiated Test Setup, 30 – 1000 MHz



Radiated Test Setup, Above 1000 MHz



Radiated Emissions, Tabular Data

8.4.1 Radiated Emissions, 420 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
420.00	840.00	PK	37.80	H	-3.45	22.19	3.00	56.54	-40.84	-13.00	27.84
420.00	840.00	PK	37.20	V	-3.45	22.19	3.00	55.94	-41.44	-13.00	28.44
420.00	1260.00	PK	28.70	H	-4.17	28.84	3.00	53.37	-44.00	-13.00	31.00
420.00	1260.00	PK	37.50	V	-4.17	28.84	3.00	62.17	-35.20	-13.00	22.20
420.00	1680.00	PK	36.60	H	-4.72	28.97	3.00	60.85	-36.53	-13.00	23.53
420.00	1680.00	PK	43.50	V	-4.72	28.97	3.00	67.75	-29.63	-13.00	16.63
420.00	2100.00	PK	14.60	H	-5.52	31.46	3.00	40.54	-56.84	-13.00	43.84
420.00	2100.00	PK	19.40	V	-5.52	31.46	3.00	45.34	-52.04	-13.00	39.04
420.00	2520.00	PK	15.30	H	-5.99	32.48	3.00	41.79	-55.59	-13.00	42.59
420.00	2520.00	PK	22.60	V	-5.99	32.48	3.00	49.09	-48.29	-13.00	35.29
420.00	2940.00	PK	31.40	H	-6.46	32.54	3.00	57.48	-39.89	-13.00	26.89
420.00	2940.00	PK	34.20	V	-6.46	32.54	3.00	60.28	-37.09	-13.00	24.09
420.00	3360.00	PK	7.70	H	-6.91	32.64	3.00	33.44	-63.94	-13.00	50.94
420.00	3360.00	PK	7.50	V	-6.91	32.64	3.00	33.24	-64.14	-13.00	51.14
420.00	3780.00	PK	4.30	H	-7.32	33.28	3.00	30.26	-67.12	-13.00	54.12
420.00	3780.00	PK	10.20	V	-7.32	33.28	3.00	36.16	-61.22	-13.00	48.22
420.00	4200.00	PK	5.10	H	-7.74	33.48	3.00	30.84	-66.54	-13.00	53.54
420.00	4200.00	PK	8.10	V	-7.74	33.48	3.00	33.84	-63.54	-13.00	50.54

8.4.2 Radiated Emissions, 445 MHz

Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
445.00	890.00	PK	39.20	H	-3.56	22.60	3.00	58.24	-39.14	-13.00	26.14
445.00	890.00	PK	33.40	V	-3.56	22.60	3.00	52.44	-44.94	-13.00	31.94
445.00	1335.00	PK	35.80	H	-4.31	28.91	3.00	60.40	-36.97	-13.00	23.97
445.00	1335.00	PK	32.80	V	-4.31	28.91	3.00	57.40	-39.97	-13.00	26.97
445.00	1780.00	PK	31.00	H	-5.03	30.32	3.00	56.29	-41.09	-13.00	28.09
445.00	1780.00	PK	27.70	V	-5.03	30.32	3.00	52.99	-44.39	-13.00	31.39
445.00	2225.00	PK	21.40	H	-5.66	31.60	3.00	47.34	-50.03	-13.00	37.03
445.00	2225.00	PK	26.20	V	-5.66	31.60	3.00	52.14	-45.23	-13.00	32.23
445.00	2670.00	PK	25.00	H	-6.16	32.47	3.00	51.31	-46.07	-13.00	33.07
445.00	2670.00	PK	22.80	V	-6.16	32.47	3.00	49.11	-48.27	-13.00	35.27
445.00	3115.00	PK	28.60	H	-6.67	32.88	3.00	54.81	-42.57	-13.00	29.57
445.00	3115.00	PK	25.40	V	-6.67	32.88	3.00	51.61	-45.77	-13.00	32.77
445.00	3560.00	PK	9.60	H	-7.10	33.06	3.00	35.56	-61.82	-13.00	48.82
445.00	3560.00	PK	11.90	V	-7.10	33.06	3.00	37.86	-59.52	-13.00	46.52
445.00	4005.00	PK	9.00	H	-7.56	33.39	3.00	34.82	-62.55	-13.00	49.55
445.00	4005.00	PK	8.90	V	-7.56	33.39	3.00	34.72	-62.65	-13.00	49.65
445.00	4450.00	PK	5.00	H	-8.00	33.85	3.00	30.85	-66.53	-13.00	53.53
445.00	4450.00	PK	15.30	V	-8.00	33.85	3.00	41.15	-56.23	-13.00	43.23

9. ANNEX-B – Test Setup Photographs

Test setup photographs are located in a separate supplementary ANNEX-B document.

10. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_12608-24_FCC 90_	1	Initial release	3/15/2024
	2	Fixed page 11-12	5/17/2024
	3	Fixed pages 11 & 13	5/22/2024

END OF TEST REPORT
