



Test Report - FCC PART 90

Applicant: Ritron, Inc.

Approved for Release By:

Signature: Bruno Clavier

Name & Title: Bruno Clavier, General Manager

Date of Signature 10/27/2021

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Table of Contents

1.	CUSTOMER INFORMATION.....	4
1.1	PART 90 TEST RESULT SUMMARY	5
2.	LOCATION OF TESTING	6
2.1	TEST LABORATORY	6
2.1	TESTING WAS PERFORMED, REVIEWED BY	6
3.	TEST SAMPLE(S) (EUT/DUT)	7
3.1	DESCRIPTION OF THE EUT	7
3.2	CONFIGURATION OF EUT	8
3.3	TEST SETUP OF EUT	8
4.	TEST METHODS & APPLICABLE REGULATORY LIMITS.....	9
4.1	TEST METHODS/STANDARDS/GUIDANCE:	9
4.2	APPLIED LIMITS AND REGULATORY LIMITS:.....	9
5.	MEASUREMENT UNCERTAINTY.....	9
6.	ENVIRONMENTAL CONDITIONS	9
6.1	TEMPERATURE & HUMIDITY	9
7.	LIST OF TEST EQUIPMENT AND TEST FACILITY.....	10
7.1	LIST OF TEST EQUIPMENT	10
8.	TEST RESULTS	11
8.1	POWER AT THE FINAL AMPLIFIER.....	12
8.2	RF OUTPUT POWER	13
8.2.1	Test Plot, Power Output, 450.025 MHz	14
8.2.2	Test Plot, Power Output, 460.025 MHz.....	15
8.2.3	Test Plot, Power Output, 464.5 MHz	16
8.2.4	Test Plot, Power Output, 469.975 MHz.....	17
8.3	BANDWIDTH & EMISSION	18
8.3.1	Bandwidth Plot, 99%, 12.5 kHz FM, 450.025 MHz	20
8.3.2	Bandwidth Plot, 99%, 12.5 kHz NXDN, 450.025 MHz	21
8.3.3	Bandwidth Plot, 99%, 6.25 kHz NXDNSN, 450.025 MHz	22
8.3.4	Bandwidth Plot, 99%, 12.5 kHz FM, 460.025 MHz	23
8.3.5	Bandwidth Plot, 99%, 12.5 kHz NXDN, 460.025 MHz.....	24
8.3.6	Bandwidth Plot, 99%, 6.25 kHz NXDNSN, 460.025 MHz.....	25
8.3.7	Bandwidth Plot, 99%, 12.5 kHz FM, 464.5 MHz.....	26
8.3.8	Bandwidth Plot, 99%, 12.5 kHz NXDN, 464.5 MHz	27
8.3.9	Bandwidth Plot, 99%, 6.25 kHz NXDNSN, 464.5 MHz	28
8.3.10	Bandwidth Plot, 99%, 12.5 kHz FM, 469.975 MHz	29
8.3.11	Bandwidth Plot, 99%, 12.5 kHz NXDN, 469.975 MHz.....	30
8.3.12	Bandwidth Plot, 99%, 6.25 NXDNSN, 469.975 MHz	31

8.4	EMISSION LIMITATIONS, IN-BAND.....	32
8.4.1	Emission Mask, 12.5 kHz FM, 450.025 MHz.....	33
8.4.2	Emission Mask, 12.5 kHz NXDN, 450.025 MHz.....	34
8.4.3	Emission Mask, 6.25 kHz NXDNSN, 450.025 MHz.....	35
8.4.4	Emission Mask, 12.5 kHz FM, 460.025 MHz.....	36
8.4.5	Emission Mask, 12.5 kHz NXDN, 460.025 MHz.....	37
8.4.6	Emission Mask, 6.25 kHz NXDNSN, 460.025 MHz.....	38
8.4.7	Emission Mask, 12.5 kHz FM, 464.5 MHz.....	39
8.4.8	Emission Mask, 12.5 kHz NXDN, 464.5 MHz.....	40
8.4.9	Emission Mask, 6.25 kHz NXDNSN, 464.5 MHz.....	41
8.4.10	Emission Mask, 12.5 kHz FM, 469.975 MHz.....	42
8.4.11	Emission Mask, 12.5 kHz NXDN, 469.975 MHz.....	43
8.4.12	Emission Mask, 6.25 kHz NXDNSN, 469.975 MHz.....	44
8.5	EMISSION LIMITATIONS, OUT-OF-BAND.....	45
8.5.1	Conducted Emissions, Below 1GHz, 450.025 MHz.....	46
8.5.2	Conducted Emissions Above 1GHz, 450.025 MHz.....	47
8.5.3	Conducted Emissions Below 1GHz, 460.025 MHz.....	48
8.5.4	Conducted Emissions Above 1GHz, 460.025 MHz.....	49
8.5.5	Conducted Emissions Below 1GHz, 464.5 MHz.....	50
8.5.6	Conducted Emissions Above 1GHz, 464.5 MHz.....	51
8.5.7	Conducted Emissions Below 1GHz, 469.975 MHz.....	52
8.5.8	Conducted Emissions Above 1GHz, 469.975 MHz.....	53
8.6	RADIATED EMISSIONS.....	54
8.6.1	Radiated Emissions, 450.025 MHz.....	55
8.6.2	Radiated Emissions, 460.025 MHz.....	56
8.6.3	Radiated Emissions, 464.5 MHz.....	57
8.6.4	Radiated Emissions, 469.975 MHz.....	58
8.7	MODULATION CHARACTERISTICS.....	59
8.7.1	Audio Frequency Response.....	60
8.7.2	Low Pass Filter Response.....	61
8.7.3	Modulation Limiting.....	62
8.8	FREQUENCY STABILITY.....	63
8.8.1	Frequency Stability Data.....	64
8.8.2	Frequency Stability Plot.....	65
8.9	TRANSIENT FREQUENCY BEHAVIOR.....	66
8.9.1	Transient Frequency Behavior, 12.5 kHz FM, Keyed-on.....	67
8.9.2	Transient Frequency Behavior, 12.5 kHz FM, Keyed-off.....	68
8.9.3	Transient Frequency Behavior, 6.25 kHz FM, Keyed-on.....	69
8.9.4	Transient Frequency Behavior, 6.25 kHz FM, Keyed-off.....	70
8.10	ADJACENT CHANNEL POWER LIMITS.....	71
9.	ANNEX-A - PHOTOGRAPHS OF THE EUT.....	72
10.	ANNEX-B – TEST SETUP PHOTOGRAPHS.....	72
11.	HISTORY OF TEST REPORT CHANGES.....	72

1. Customer Information

Applicant: Ritron, Inc.
Address: 505 West Carmel Drive
P.O. Box 1998
Carmel, IN 46032, 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	Reported
2.1046 (a)	RF Output Power	Pass
2.1047	Modulation characteristics	Reported
2.1049	Occupied Bandwidth	Pass
2.1051	Spurious emissions at antenna terminals	Pass
2.1053	Field strength of spurious radiation	Pass
2.1055	Frequency stability	Pass

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	Pass
90.210 (n)	Emission masks, Out-of-band	Pass
90.213 (a) footnote 10	Frequency stability	Pass
90.214	Transient Frequency Behavior	Pass
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 Timco's permanent laboratory located at 849 NW State Road 45, Newberry, Florida 32669

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

2.1 Testing was performed, reviewed by

Dates of Testing: 10/20/2021

Signature:



Sr. EMC Engineer
EMC-003838-NE



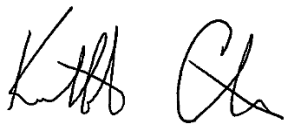
Name & Title:

Tim Royer, EMC Engineer

Date of Signature

10/27/2021

Signature:



Name & Title:

Kristoffer Costa, EMC Technician

Date of Signature

10/27/2021

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

The test sample was received: 10/20/2021

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:	AIERIT51-46006
Brief Description	UHF Transceiver
Type of Modular	n/a
Model(s) #	DTXM-460-0BN6I-M-FIPS DTXM-460-0BN6I-NXDN
Firmware version	n/a
Software version	n/a
Serial Number	A100849948

Technical Characteristics	
Technology	UHF Transceiver
Frequency Range	450 MHz-470 MHz
RF O/P Power (Max.)	6W
Modulation	n/a
Bandwidth & Emission Class	10K0F3E, 4K00F1E, 8K30F1E, 4K00F1D, 8K30F1D, 4K00F7W, 8K30F7W
Duty Cycle	100%
Antenna Connector	BNC
Voltage Rating (AC or Batt.)	11-16VDC

Antenna Characteristics			
Antenna	Frequency Range	Mode / BW	Antenna Gain
1	450 MHz-470 MHz	Transmit	0 dBi

3.2 Configuration of EUT

Test Modes				
Mode (#)	Mode (Type)	Test Frequencies (MHz)	BW (nominal) (kHz)	Emission Designator
1	Transmit	450.025 MHz 460.025 MHz 464.5 MHz 469.975 MHz	6.25kHz 12.5 kHz	10K0F3E, 4K00F1E, 8K30F1E, 4K00F1D, 8K30F1D, 4K00F7W, 8K30F7W

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

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	<u>Double-Ridged Horn/ETS Horn 1</u>	ETS-Lindgren	3117	00035923	2/25/20	2/24/2023
CHAMBER	<u>CHAMBER</u>	Panashield	3M	N/A	3/12/19	3/11/2022
Receiver	<u>EMI Test Receiver R&S ESU 40</u>	Rohde & Schwarz	ESU 40	100320	5/27/21	5/26/2024
Function Generator	<u>Function Generator</u>	Standford	DS340	25200	1/13/21	1/13/2024
Signal Generator	<u>Signal Generator HP 8648C</u>	HP	8648C	3847A04696	3/31/21	3/30/2024
Thermometer	<u>Type K J Thermometer</u>	Martel	303	080504494	1/18/20	1/17/2023
Oscilloscope	<u>Oscilloscope</u>	LeCroy	LT364	00414	3/28/19	3/27/2022
Frequency Counter	<u>Frequency Counter Small</u>	HP	5385A	3242A07460	9/9/20	9/9/2023

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.

8.1 Power at the Final Amplifier

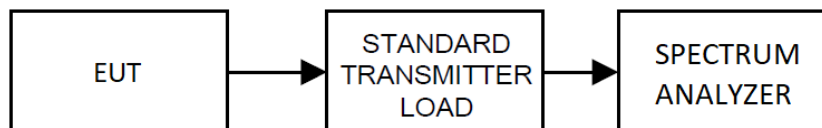
Limits from FCC Part 2.1033 (c)(8). No method of measurement is specified.

Test Results		
EUT Operating Voltage (V)	EUT Current (A)	Power at the Final Amplifier (W)
12	6	75

8.2 RF Output Power

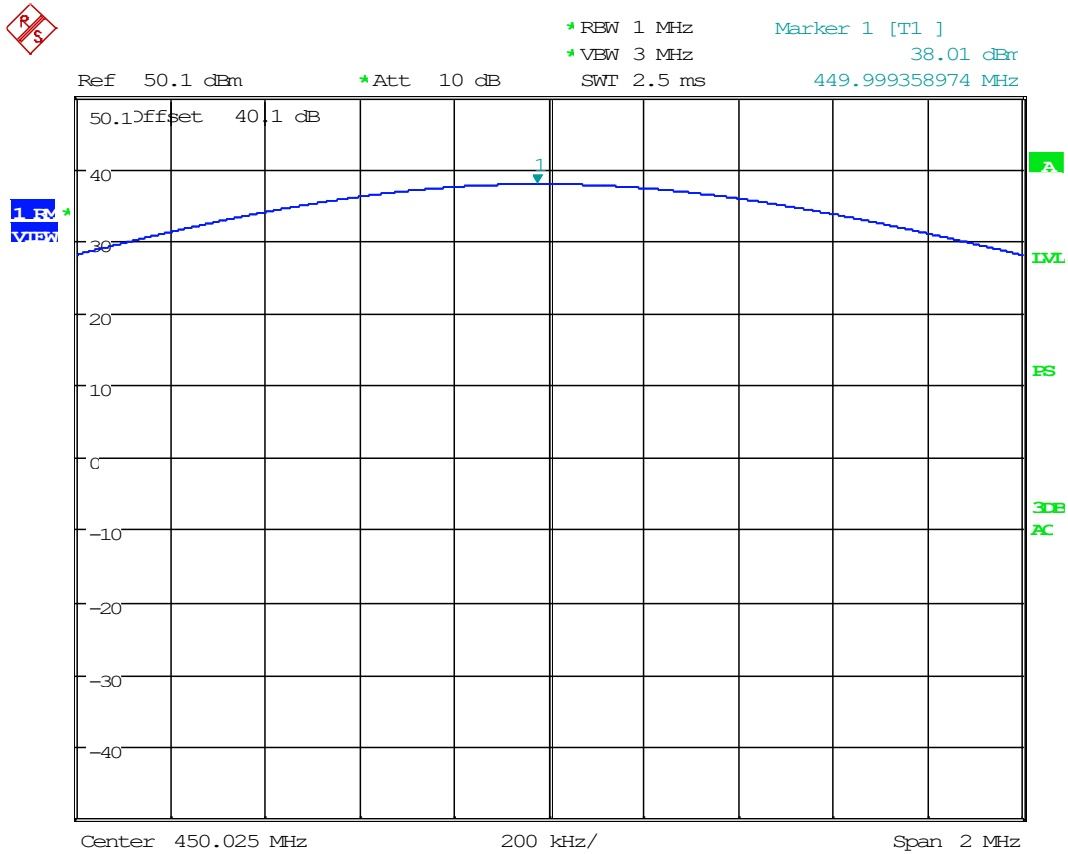
Limits from FCC Parts 2.1046(a), and 90.205 (r); and test procedure from ANSI C63.26-2015.

Test Setup



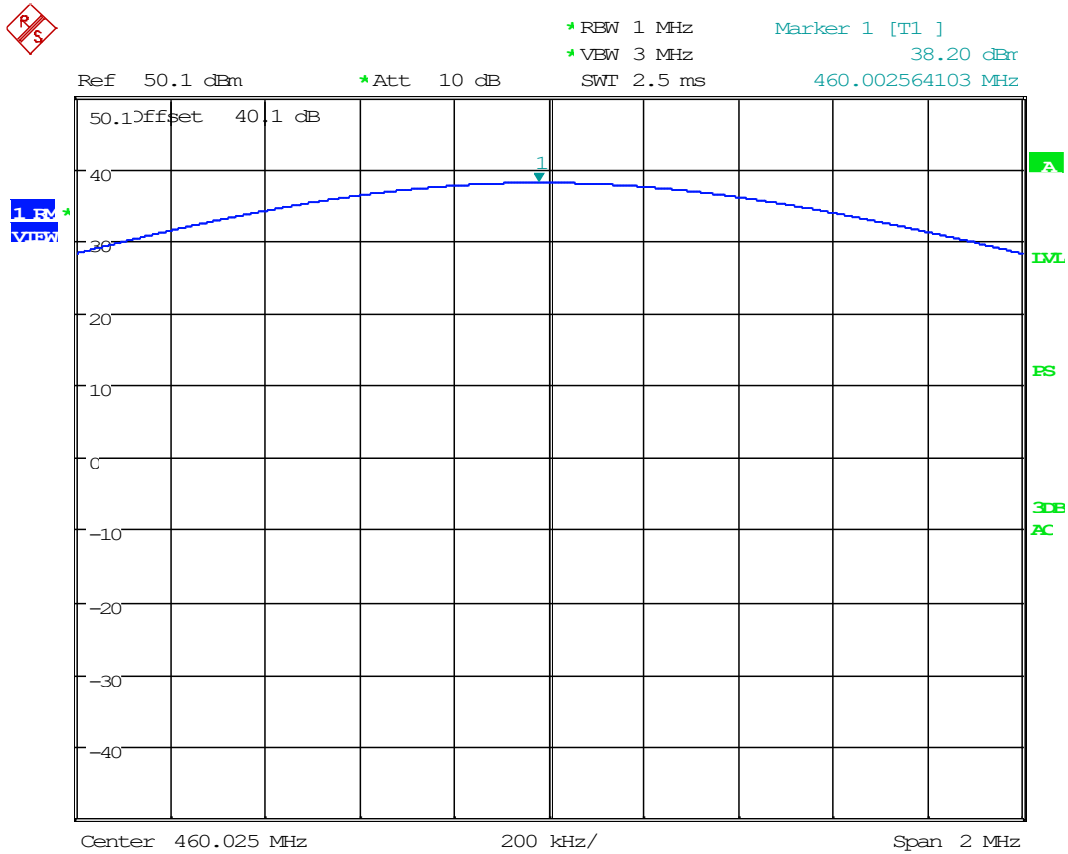
Test Results, Mode 1		
Tuned Frequency (MHz)	Power Output (dBm)	Power Output (W)
450.025	38.01	6.32
460.025	38.2	6.6
464.5	38.2	6.6
469.975	38.13	6.5

8.2.1 Test Plot, Power Output, 450.025 MHz



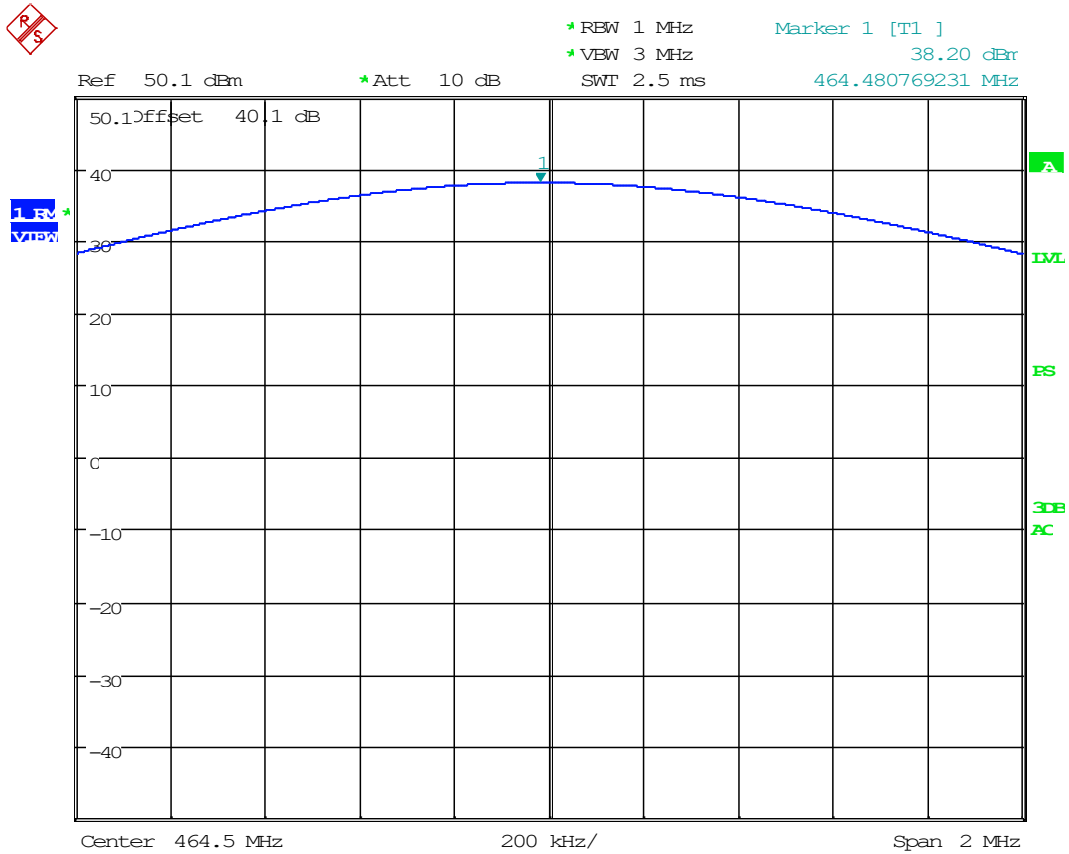
Date: 21.OCT.2021 09:41:09

8.2.2 Test Plot, Power Output, 460.025 MHz



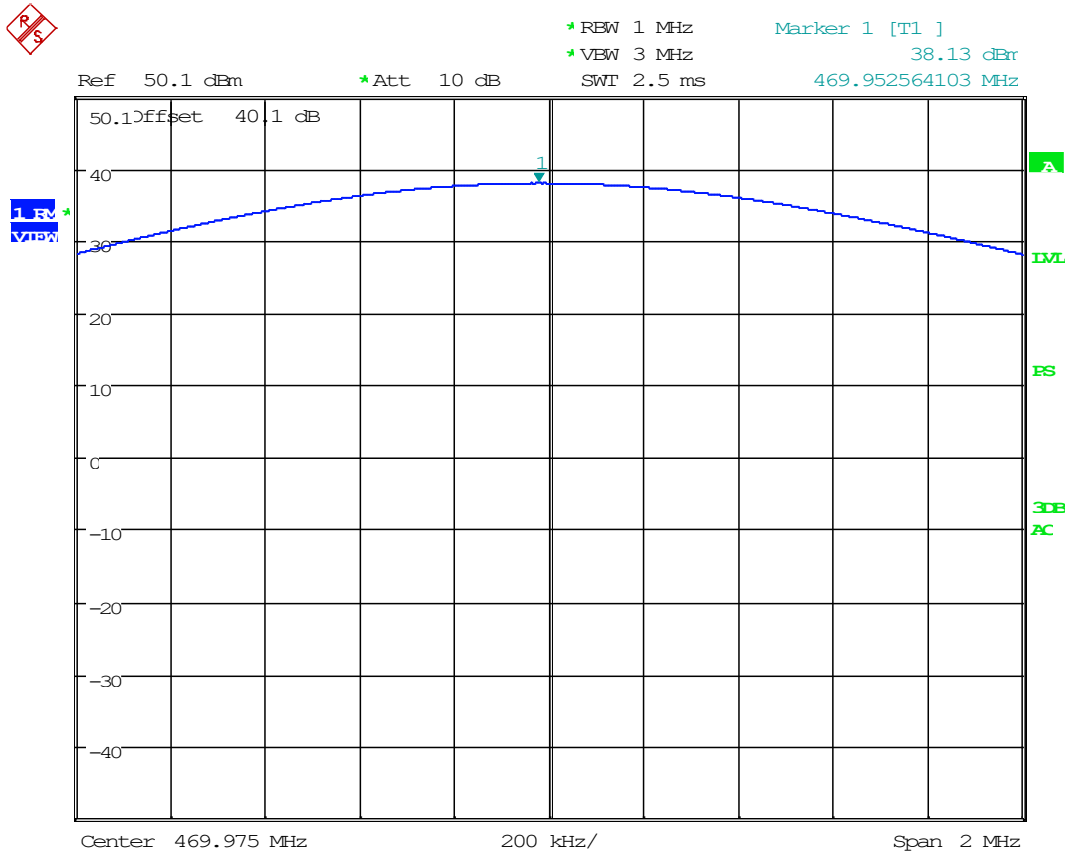
Date: 21.OCT.2021 09:41:54

8.2.3 Test Plot, Power Output, 464.5 MHz



Date: 21.OCT.2021 09:43:21

8.2.4 Test Plot, Power Output, 469.975 MHz

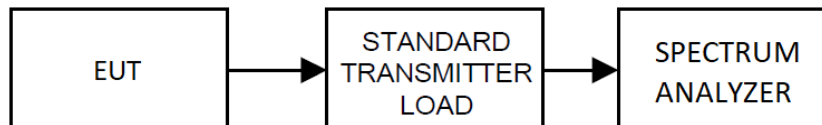


Date: 21.OCT.2021 09:42:40

8.3 Bandwidth & Emission

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

Test Setup



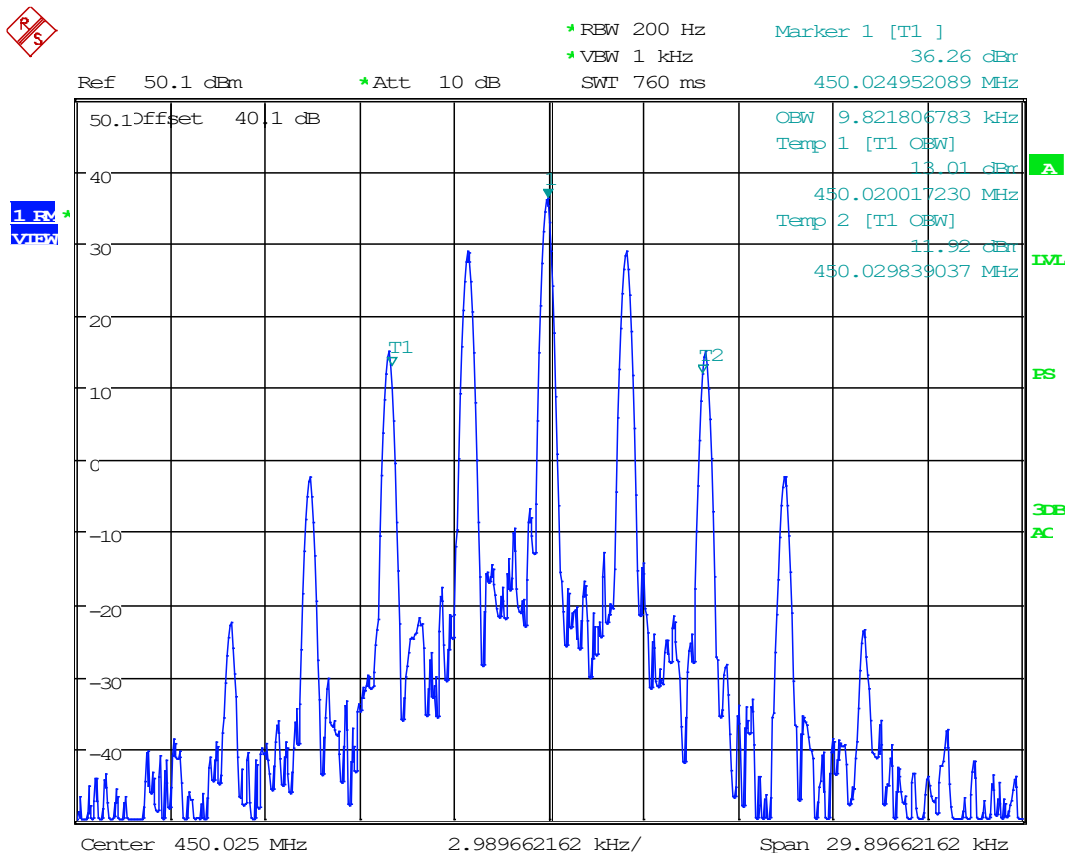
Test Results, Authorized Bandwidth

Rule Part	Operating Range (MHz)	Authorized Bandwidth (kHz)
Part 90	450-470	12.5
Part 90	450-470	6.25

Test Results, Occupied Bandwidth				
Tuned Frequency (MHz)	Mode	Emission Designator	Occupied Bandwidth (kHz)	Bandwidth Type
450.025	12.5 kHz Analog	10K0F3E	9.822	99%
	12.5 kHz NXDN	8K30F1E, F1D, F7W	7.465	99%
	6.25 NXDNSN	4K00F1E, F1D, F7W	3.713	99%
460.025	12.5 kHz Analog	10K0F3E	9.774	99%
	12.5 kHz NXDN	8K30F1E, F1D, F7W	7.618	99%
	6.25 NXDNSN	4K00F1E, F1D, F7W	3.677	99%
464.5	12.5 kHz Analog	10K0F3E	9.87	99%
	12.5 kHz NXDN	8K30F1E, F1D, F7W	7.81	99%
	6.25 NXDNSN	4K00F1E, F1D, F7W	3.75	99%
469.975	12.5 kHz Analog	10K0F3E	9.87	99%
	12.5 kHz NXDN	8K30F1E, F1D, F7W	7.58	99%
	6.25 NXDNSN	4K00F1E, F1D, F7W	3.731	99%

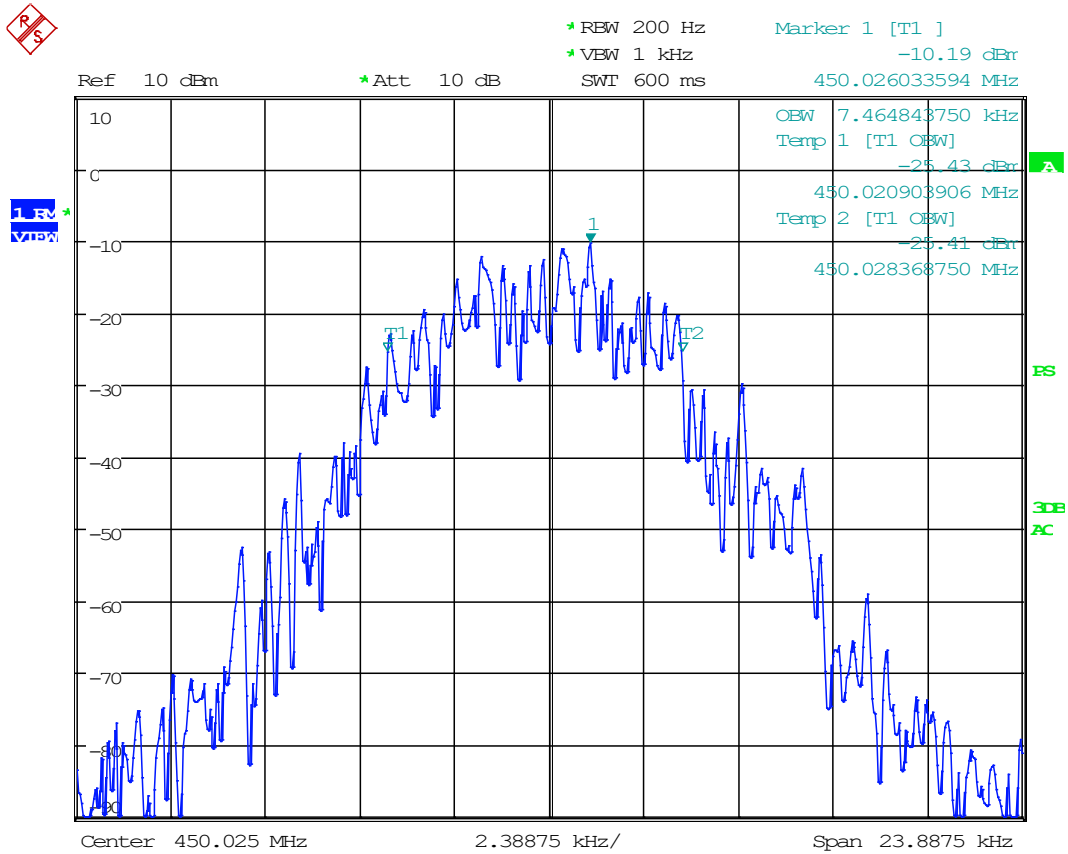
Occupied Bandwidth, Spectrum Plots

8.3.1 Bandwidth Plot, 99%, 12.5 kHz FM, 450.025 MHz



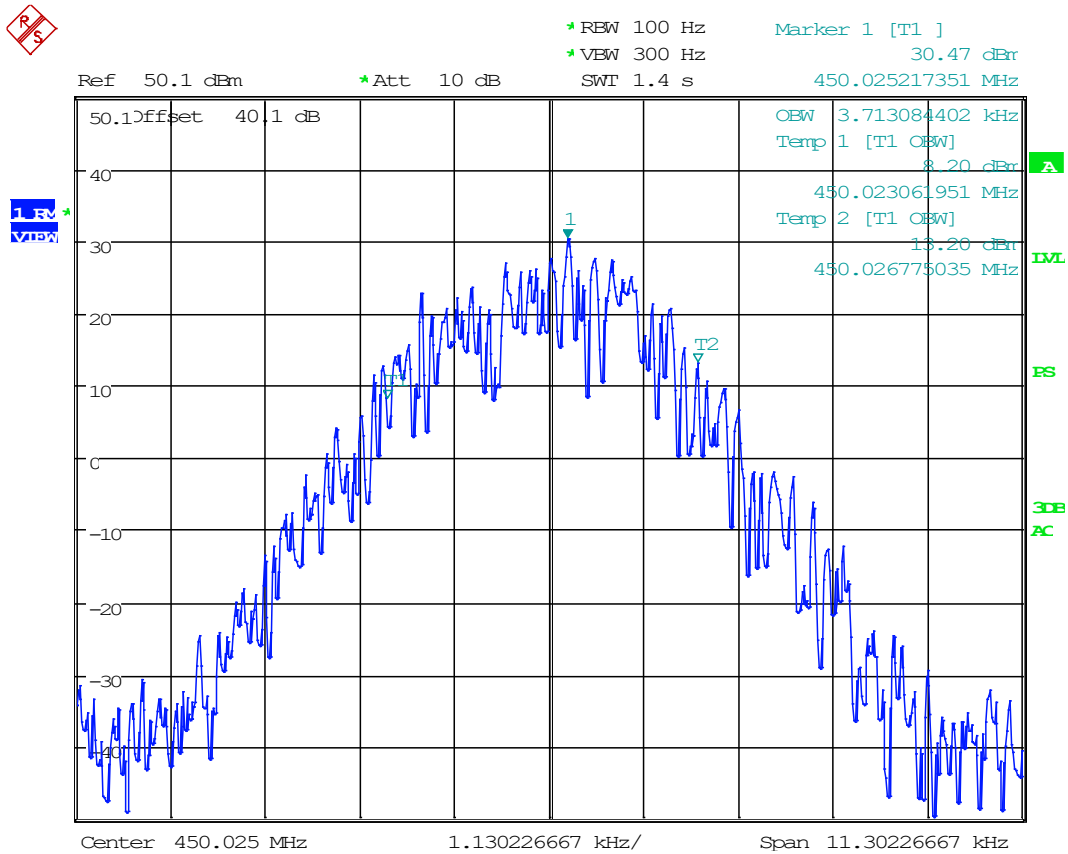
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8.3.2 Bandwidth Plot, 99%, 12.5 kHz NXDN, 450.025 MHz



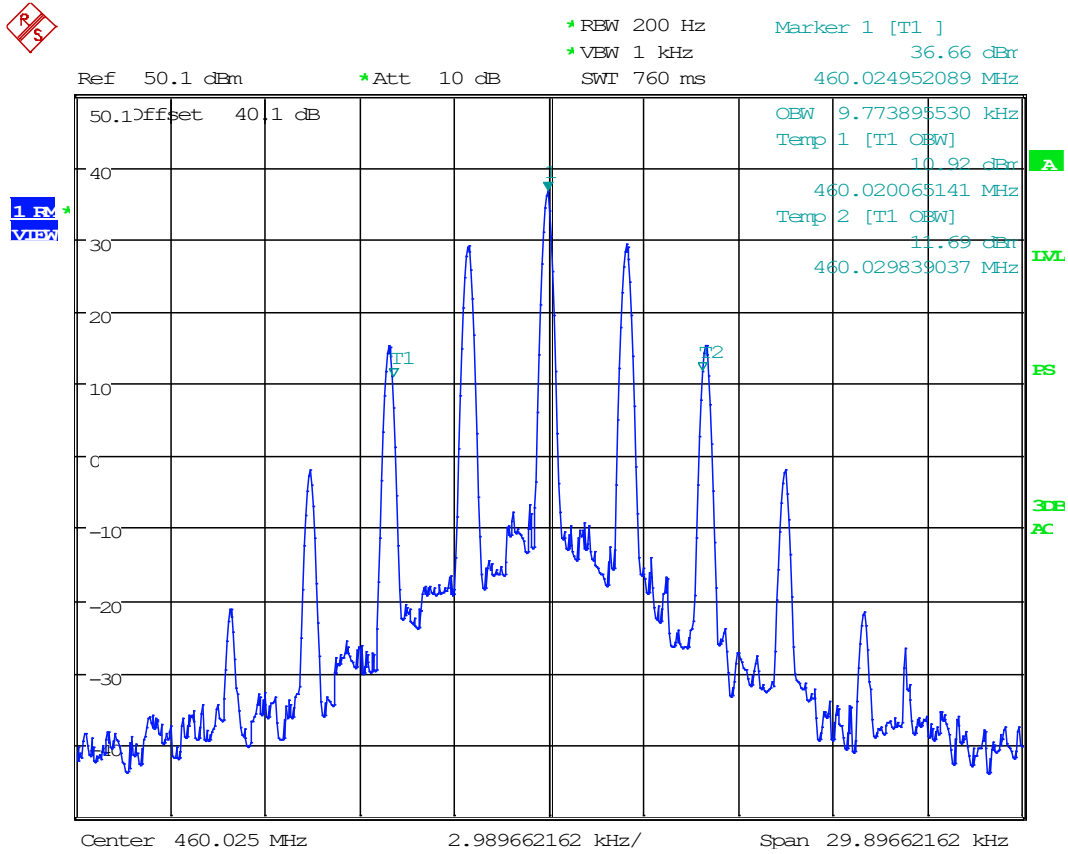
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8.3.3 Bandwidth Plot, 99%, 6.25 kHz NXDNSN, 450.025 MHz



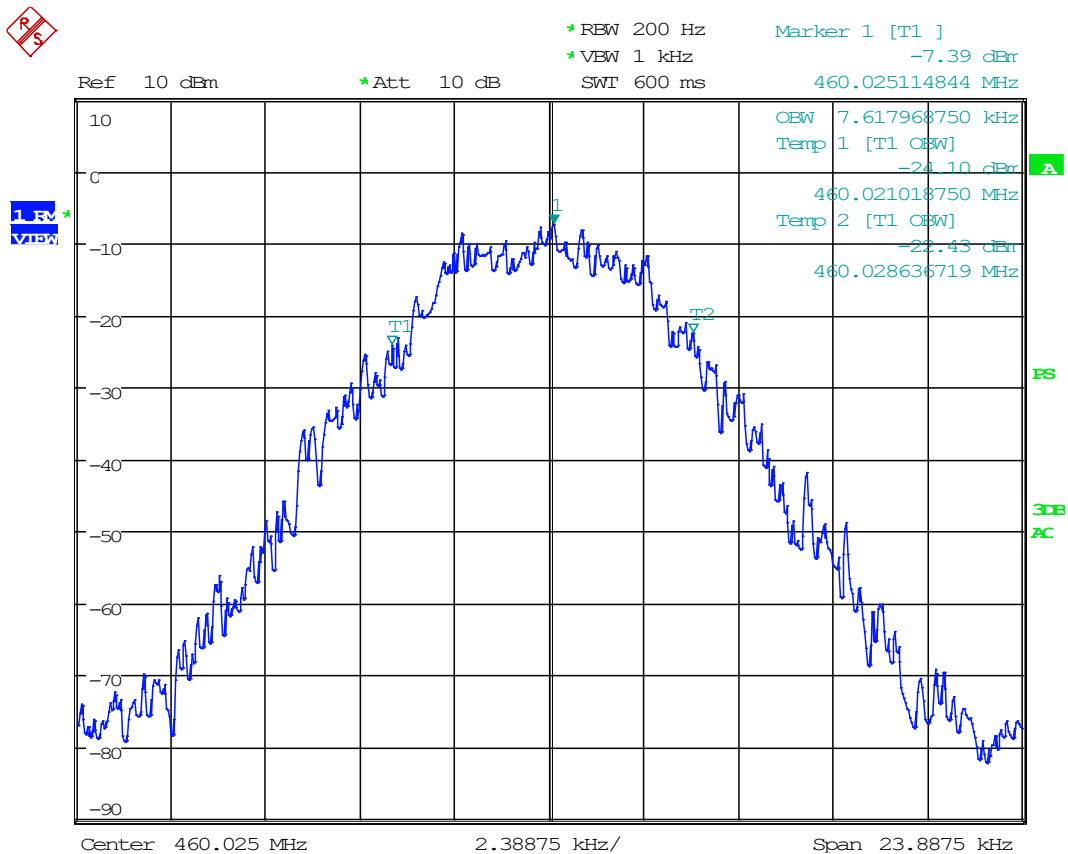
Date: 21.OCT.2021 10:08:41

8.3.4 Bandwidth Plot, 99%, 12.5 kHz FM, 460.025 MHz



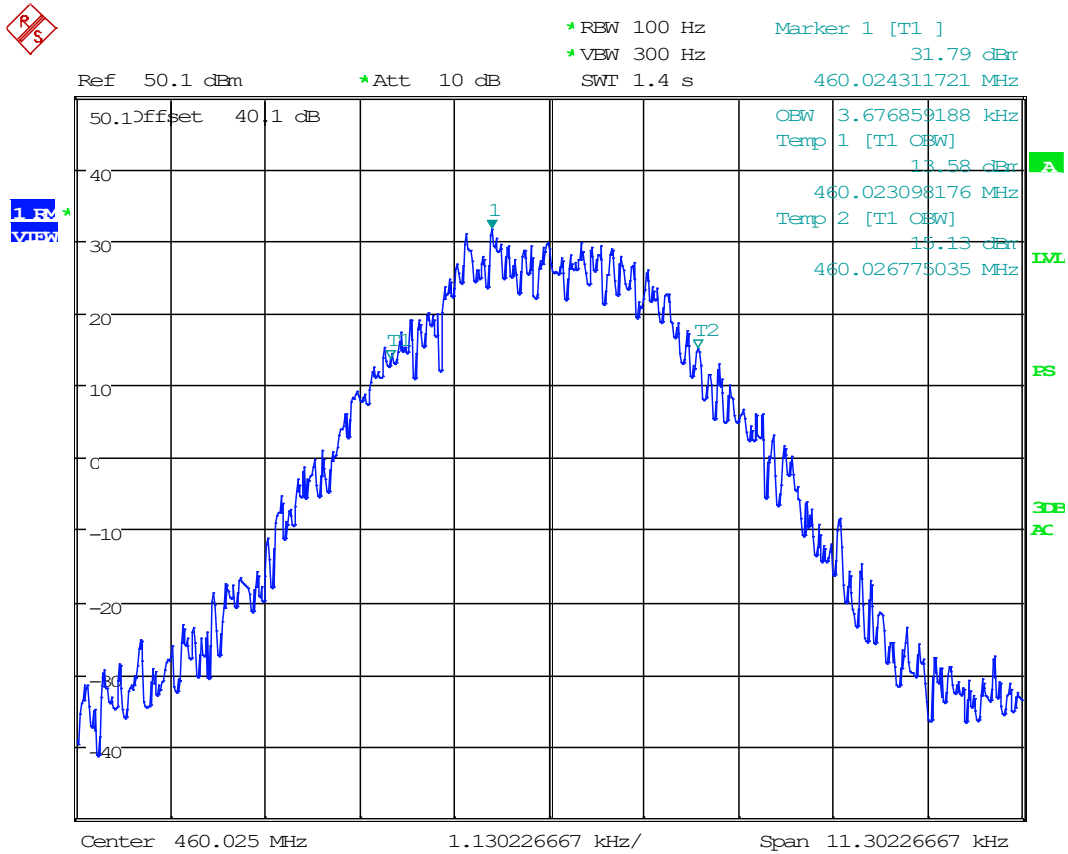
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8.3.5 Bandwidth Plot, 99%, 12.5 kHz NXDN, 460.025 MHz



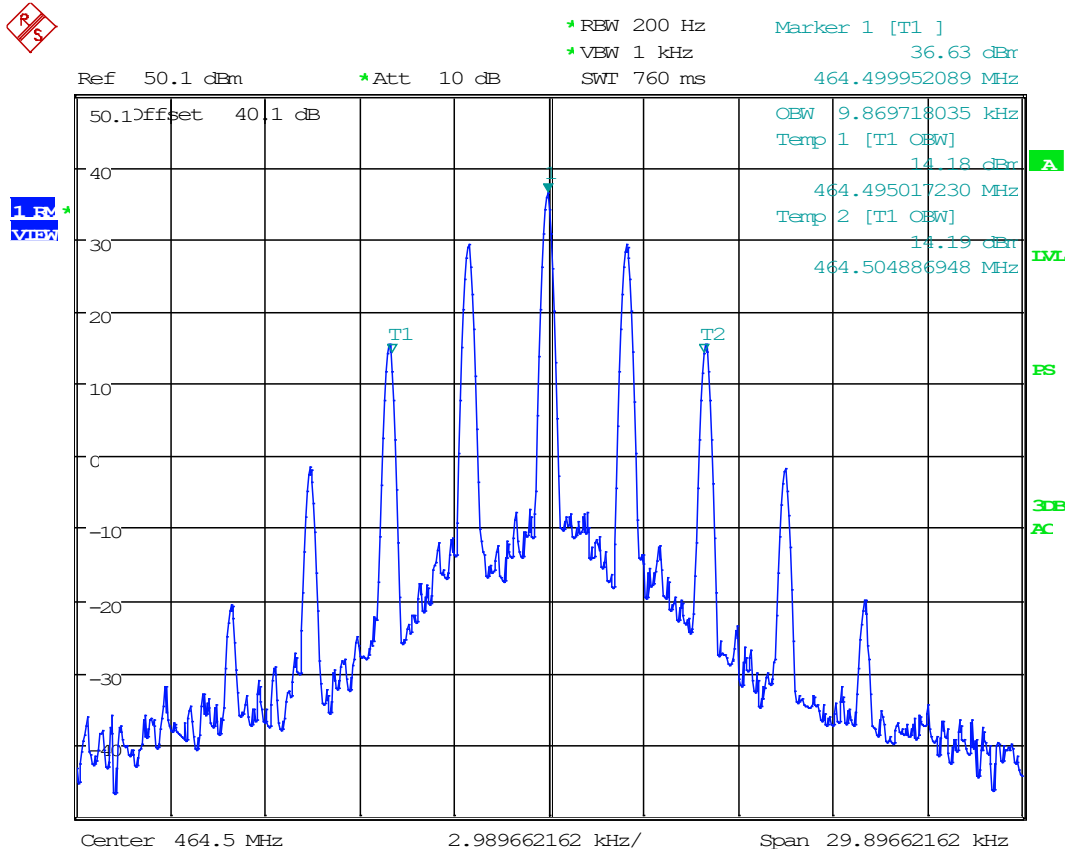
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8.3.6 Bandwidth Plot, 99%, 6.25 kHz NXDNSN, 460.025 MHz



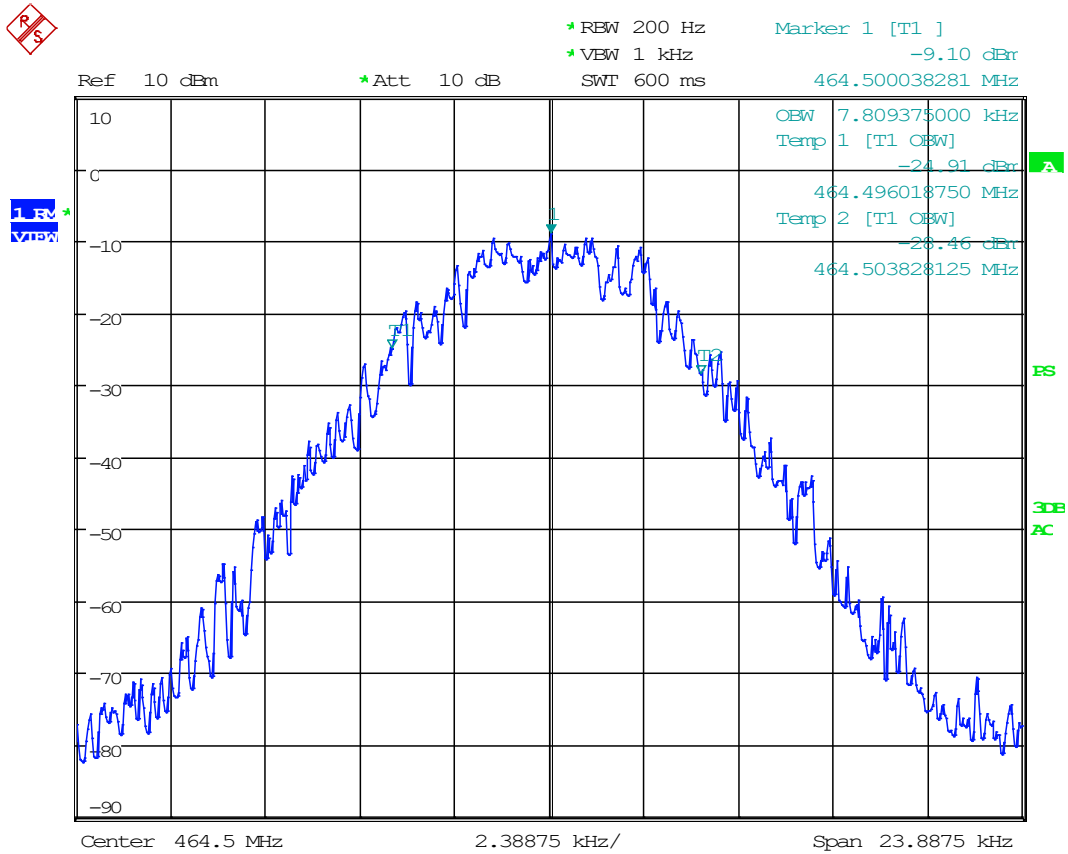
Date: 21.OCT.2021 10:10:40

8.3.7 Bandwidth Plot, 99%, 12.5 kHz FM, 464.5 MHz



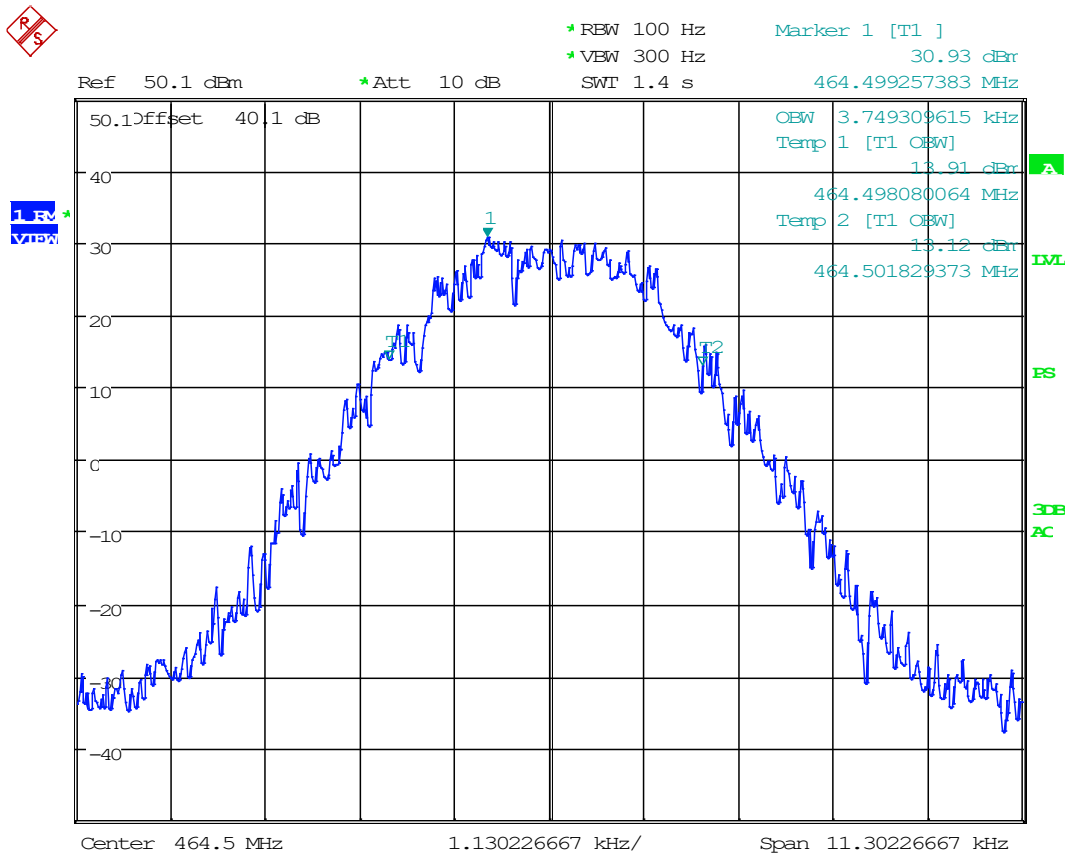
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8.3.8 Bandwidth Plot, 99%, 12.5 kHz NXDN, 464.5 MHz



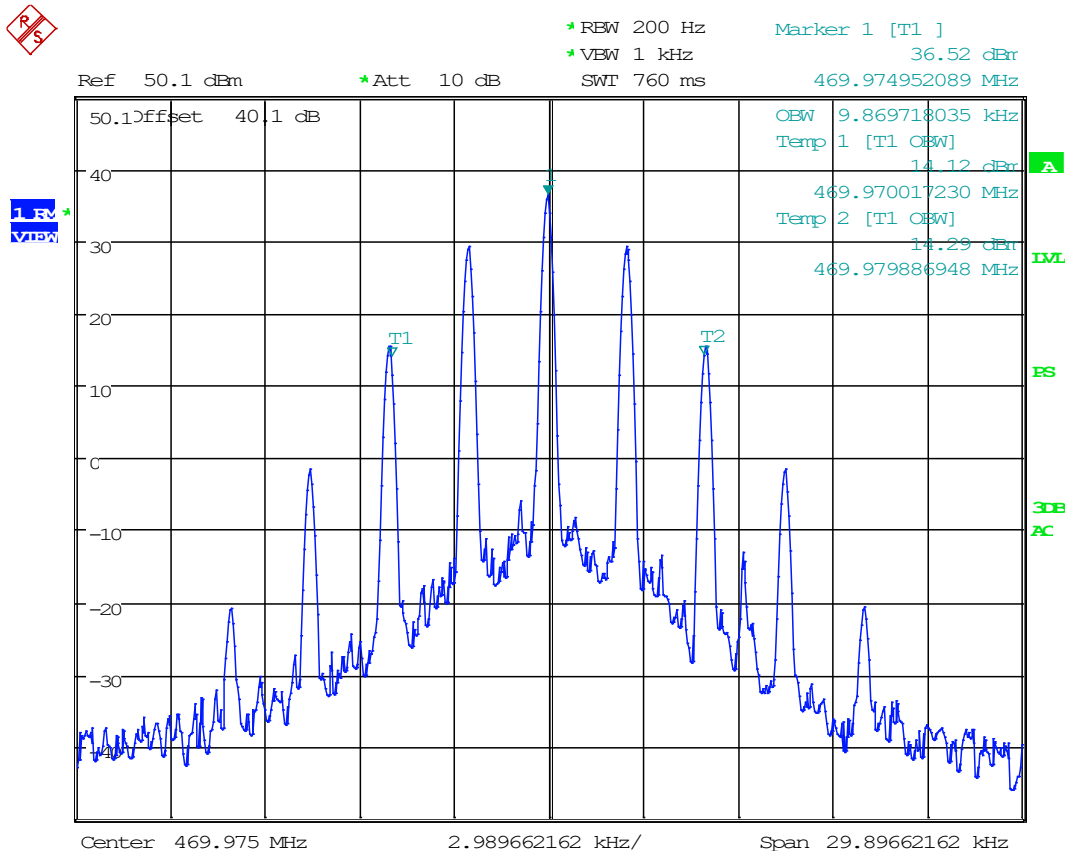
Date: 21.OCT.2021 09:28:15

8.3.9 Bandwidth Plot, 99%, 6.25 kHz NXDNSN, 464.5 MHz



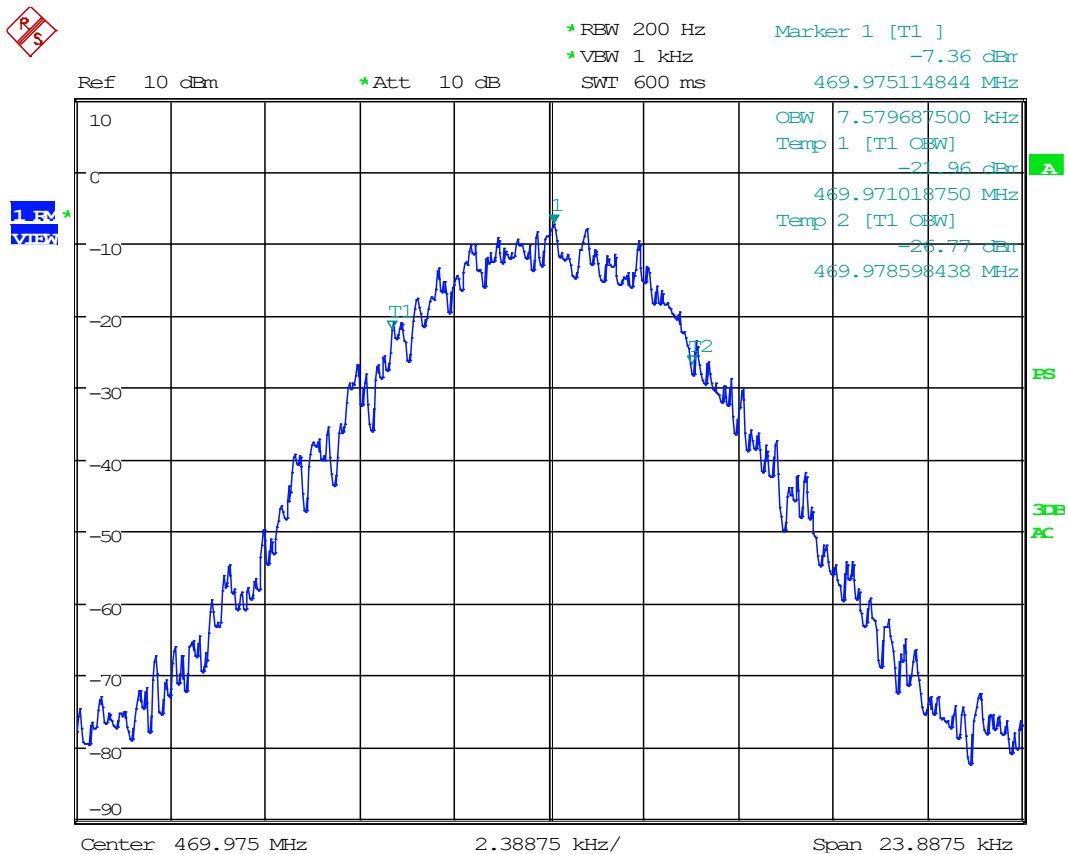
Date: 21.OCT.2021 10:11:56

8.3.10 Bandwidth Plot, 99%, 12.5 kHz FM, 469.975 MHz



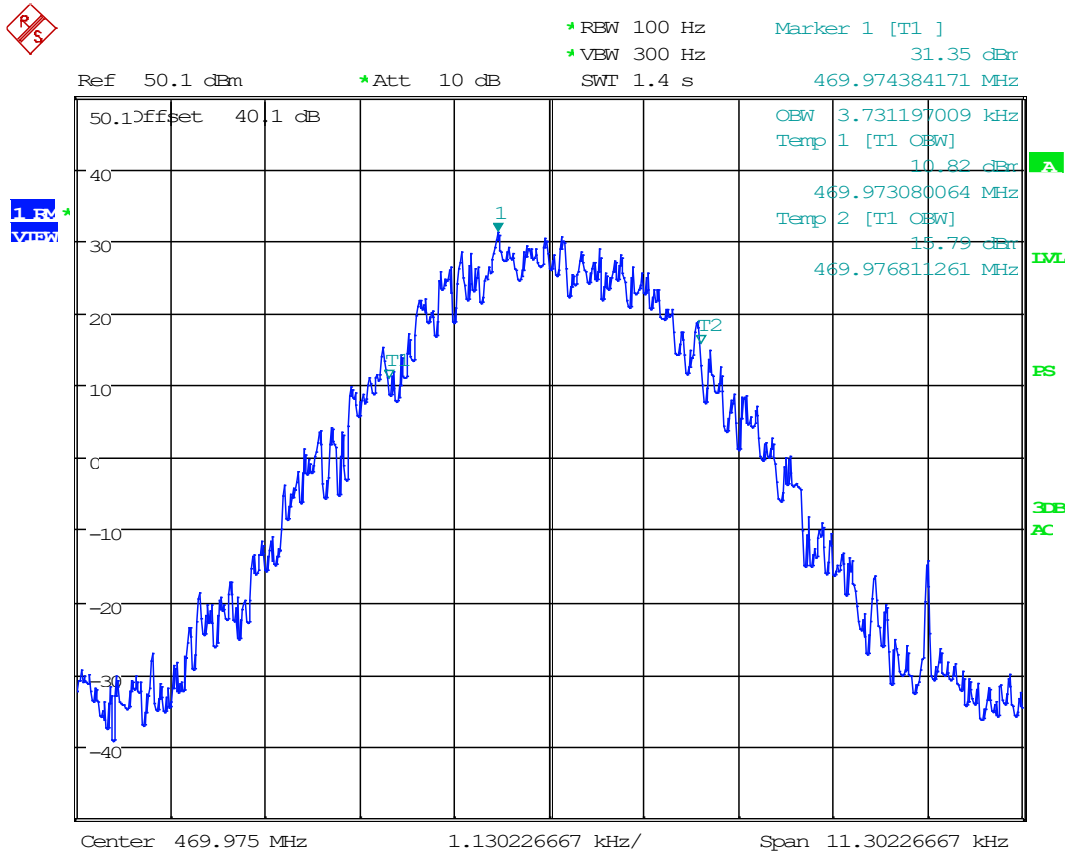
Date: 21.OCT.2021 10:05:55

8.3.11 Bandwidth Plot, 99%, 12.5 kHz NXDN, 469.975 MHz



Date: 21.OCT.2021 09:27:33

8.3.12 Bandwidth Plot, 99%, 6.25 NXDNSN, 469.975 MHz

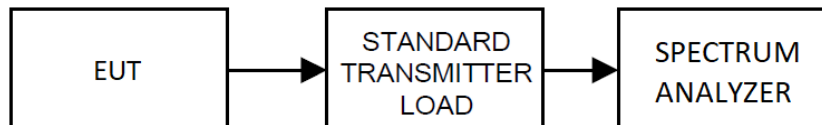


Date: 21.OCT.2021 10:11:15

8.4 Emission Limitations, In-Band

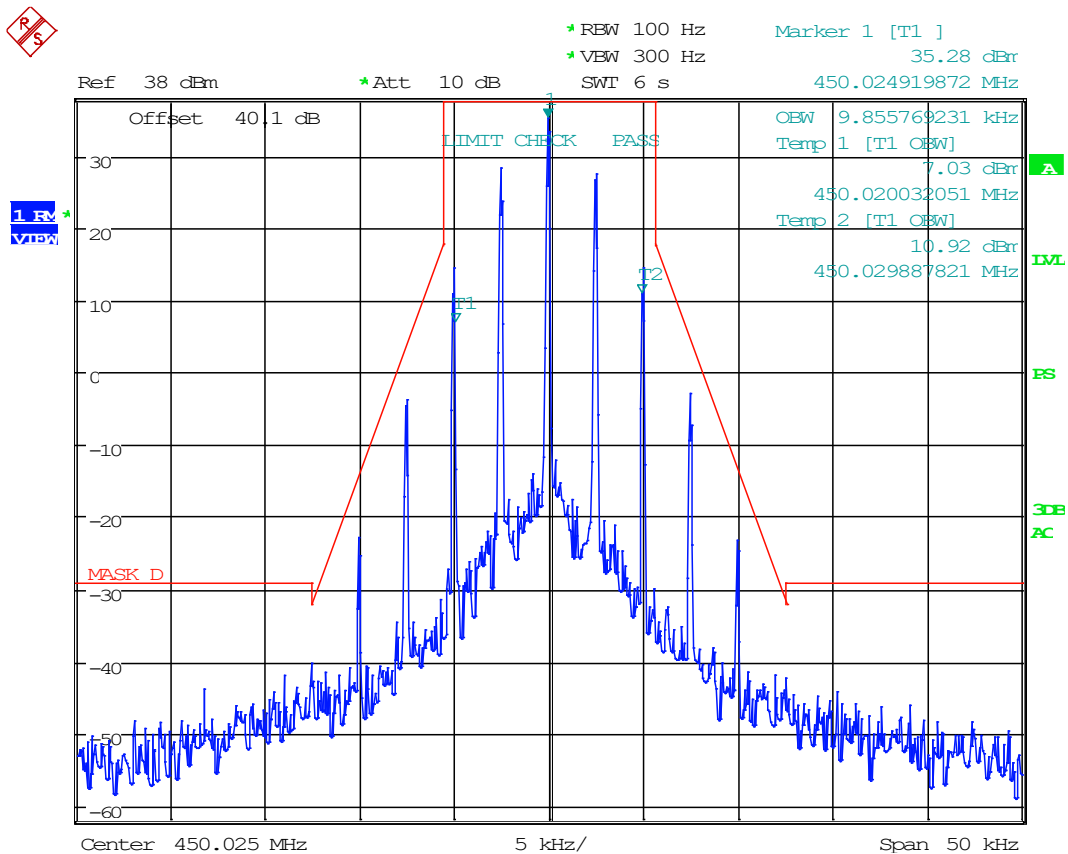
Limits from FCC Part 90.210; and test procedure from ANSI C63.26-2015.

Conducted Test Setup



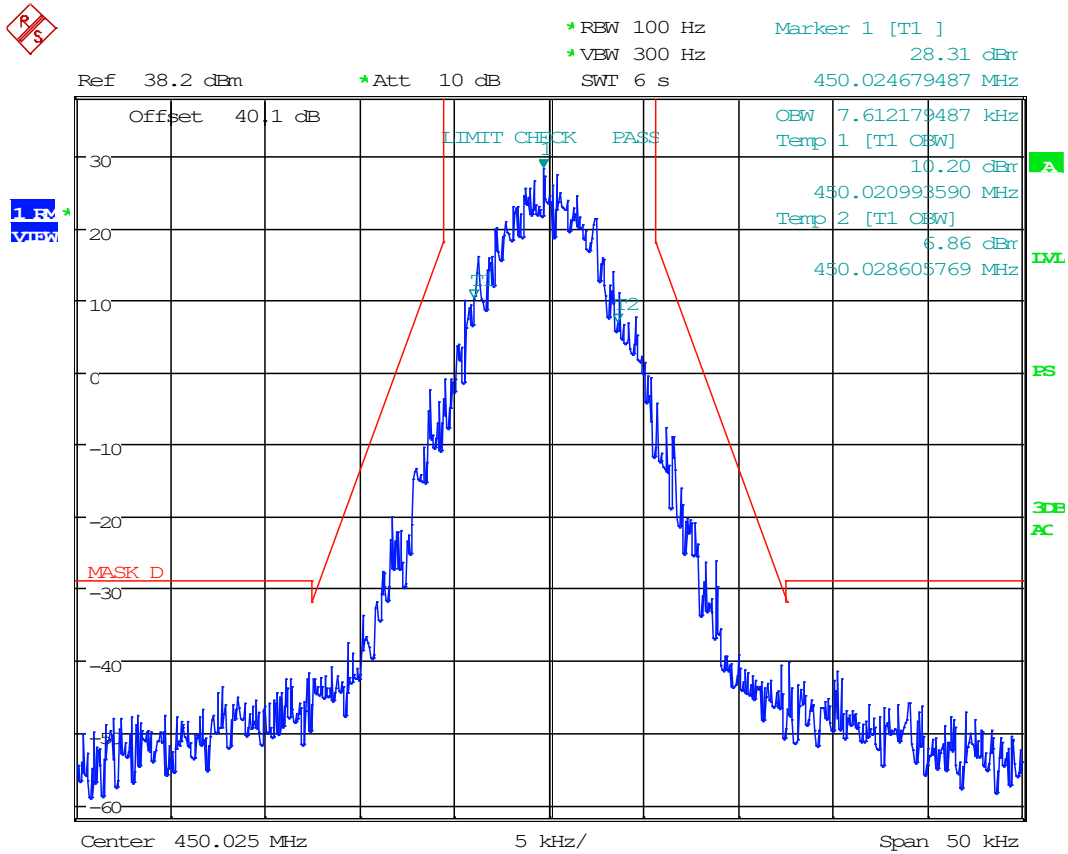
Conducted Emissions Mask, Spectrum Plots

8.4.1 Emission Mask, 12.5 kHz FM, 450.025 MHz



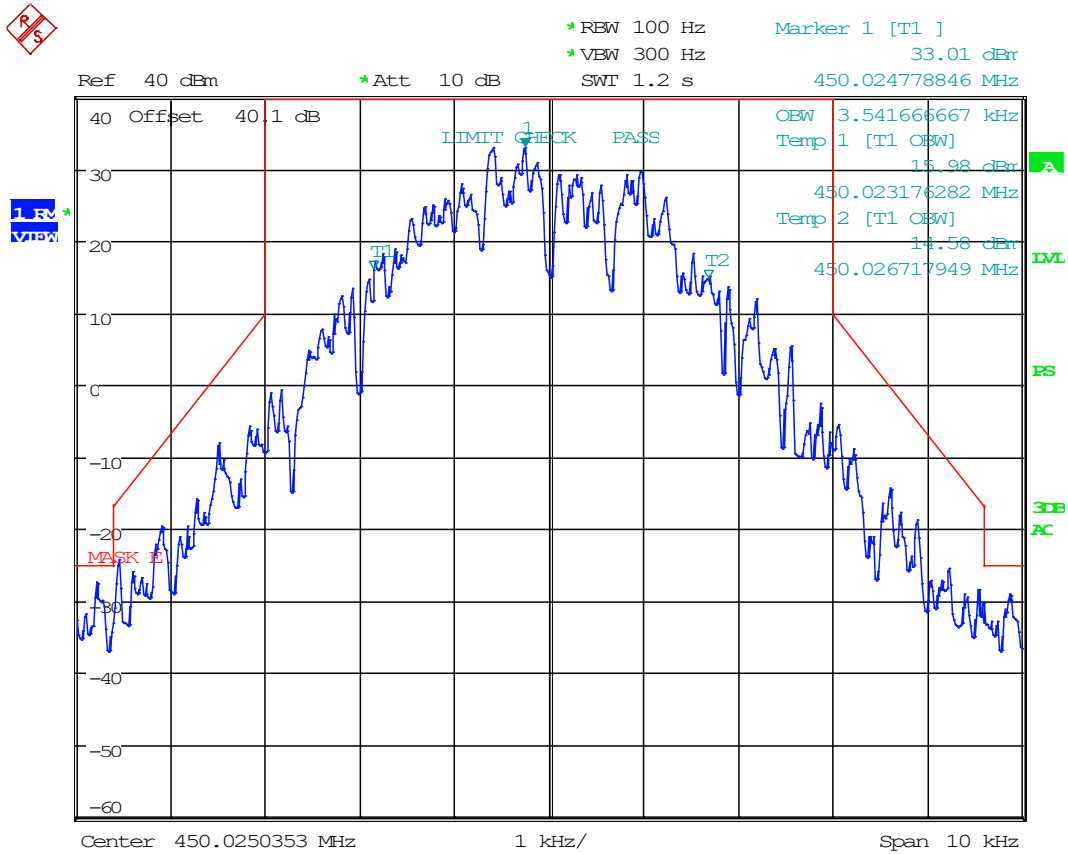
Date: 21.OCT.2021 10:20:33

8.4.2 Emission Mask, 12.5 kHz NXDN, 450.025 MHz



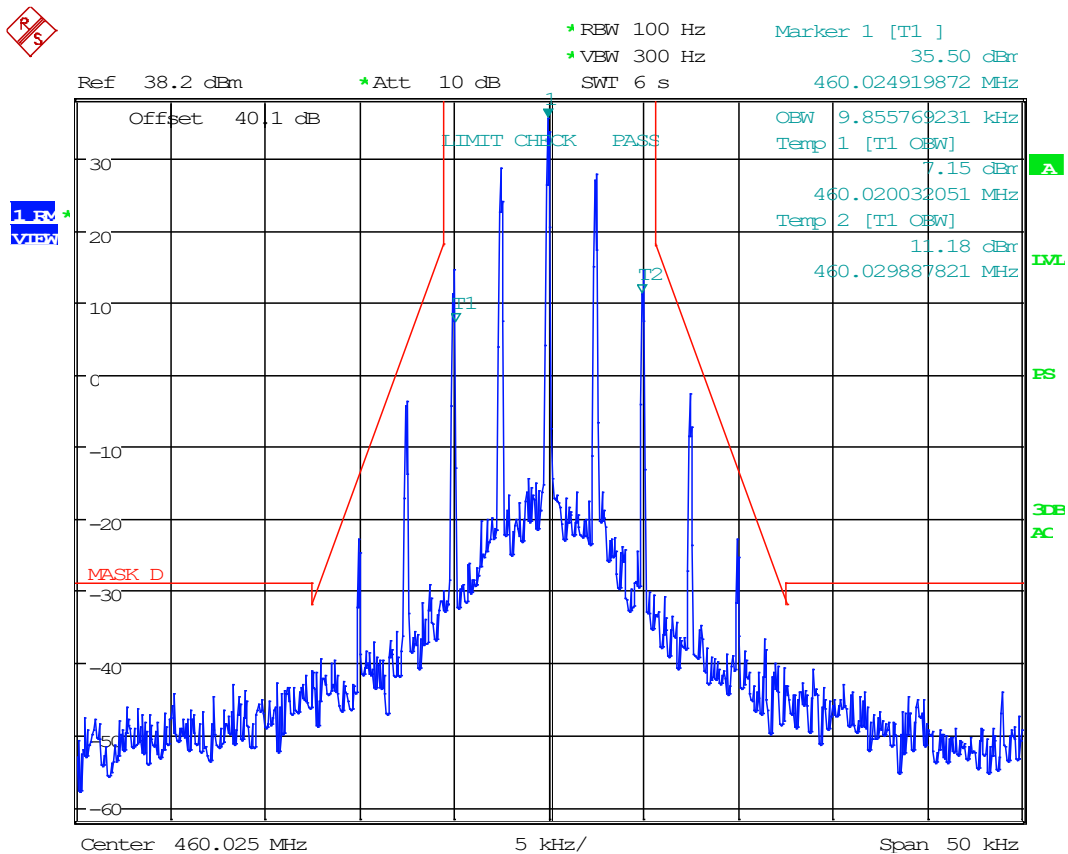
Date: 21.OCT.2021 10:39:16

8.4.3 Emission Mask, 6.25 kHz NXDNSN, 450.025 MHz



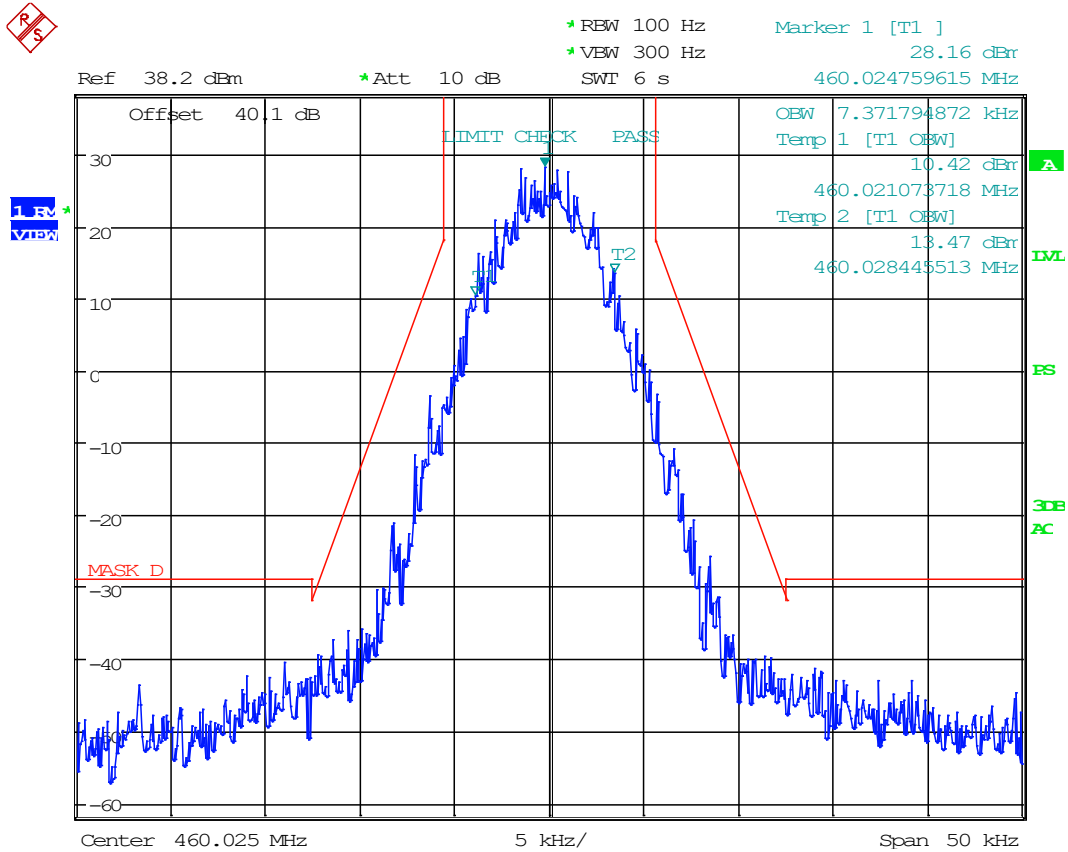
Date: 21.OCT.2021 10:51:38

8.4.4 Emission Mask, 12.5 kHz FM, 460.025 MHz



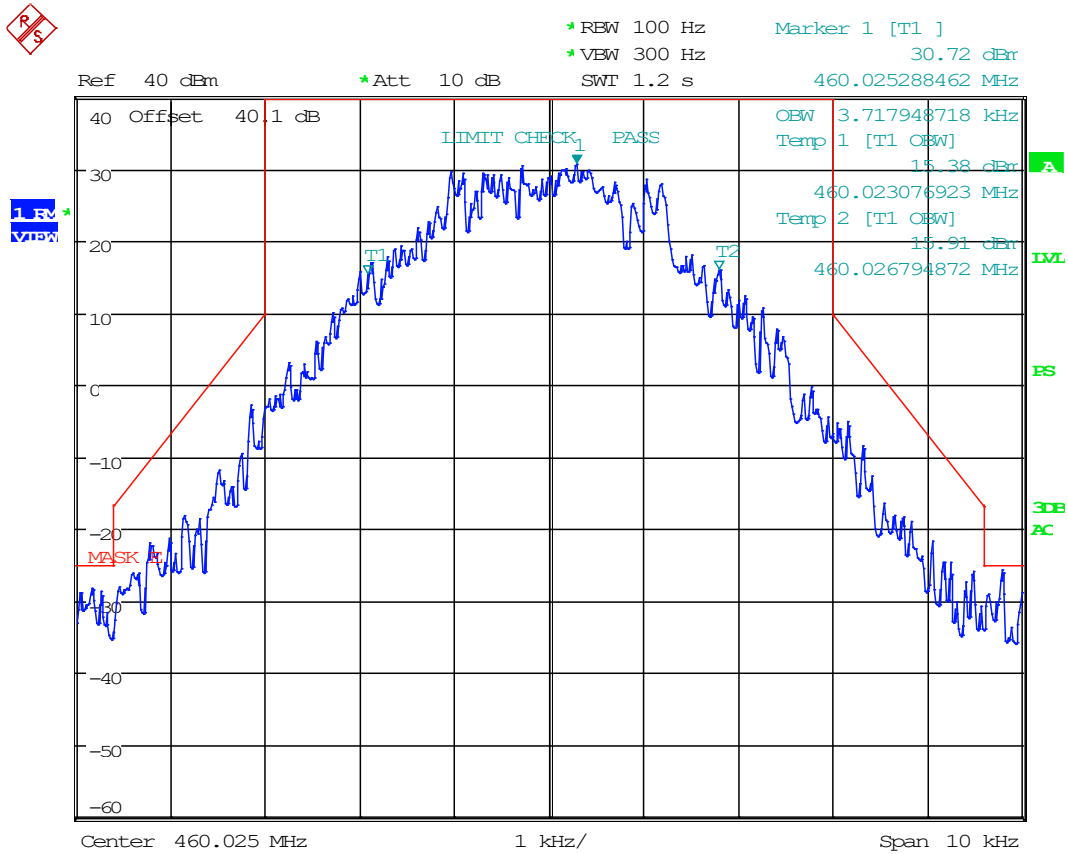
Date: 21.OCT.2021 10:22:40

8.4.5 Emission Mask, 12.5 kHz NXDN, 460.025 MHz



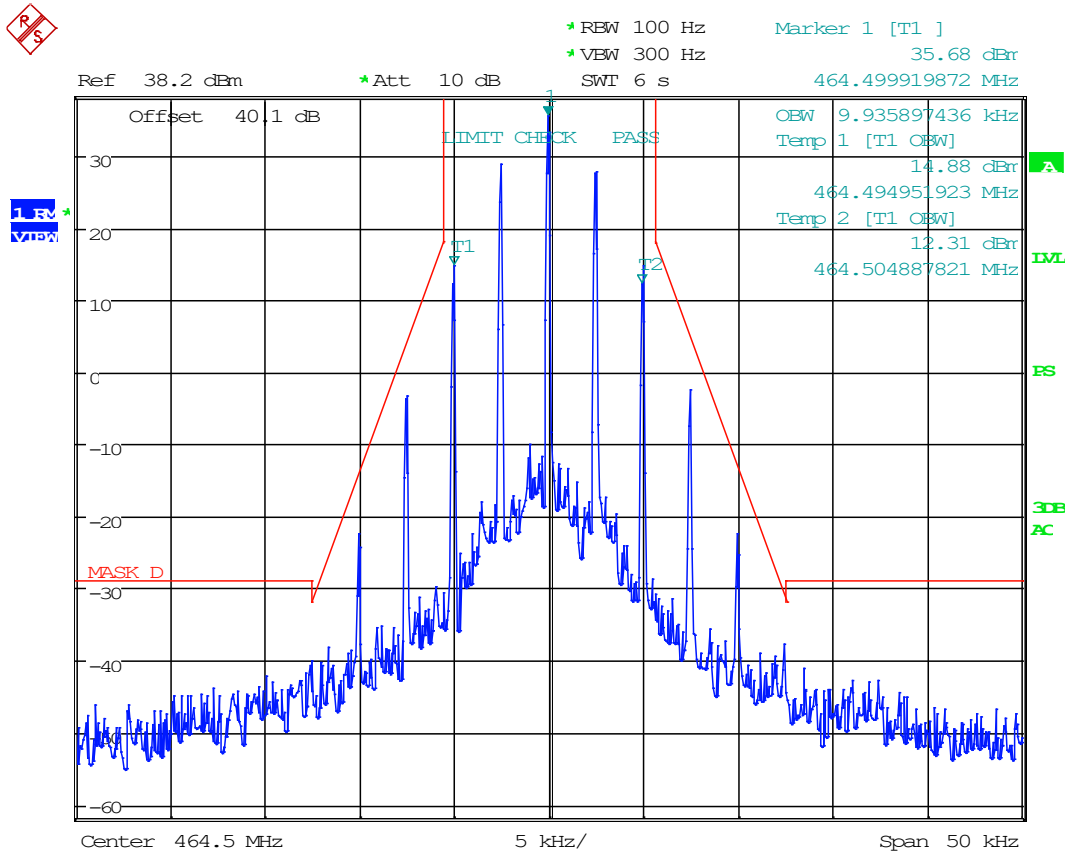
Date: 21.OCT.2021 10:43:15

8.4.6 Emission Mask, 6.25 kHz NXDNSN, 460.025 MHz



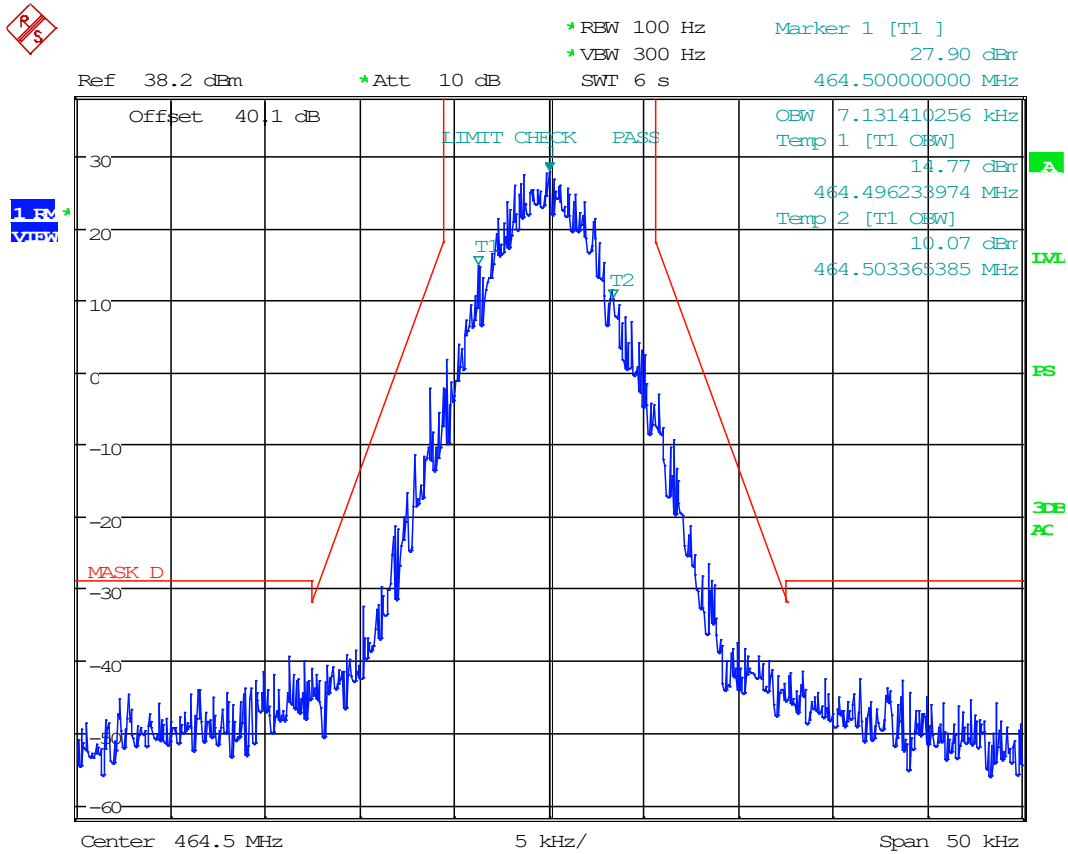
Date: 21.OCT.2021 10:52:51

8.4.7 Emission Mask, 12.5 kHz FM, 464.5 MHz



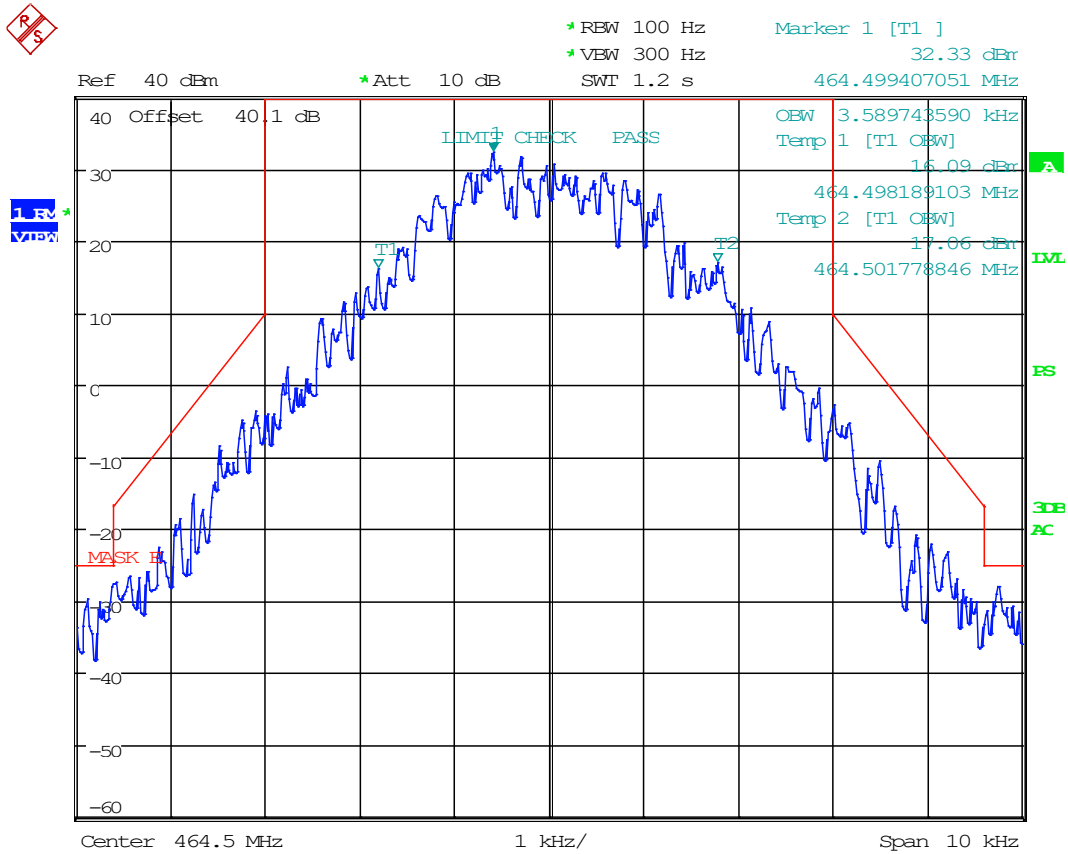
Date: 21.OCT.2021 10:26:39

8.4.8 Emission Mask, 12.5 kHz NXDN, 464.5 MHz



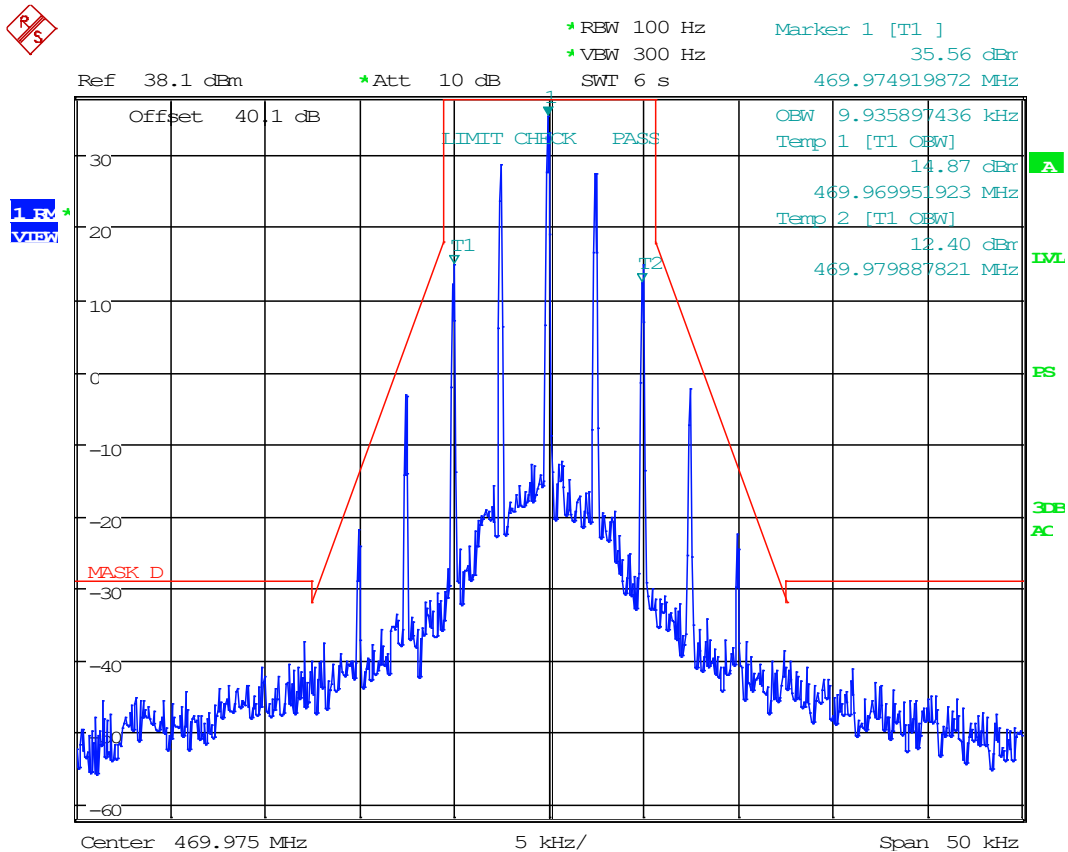
Date: 21.OCT.2021 10:45:38

8.4.9 Emission Mask, 6.25 kHz NXDNSN, 464.5 MHz



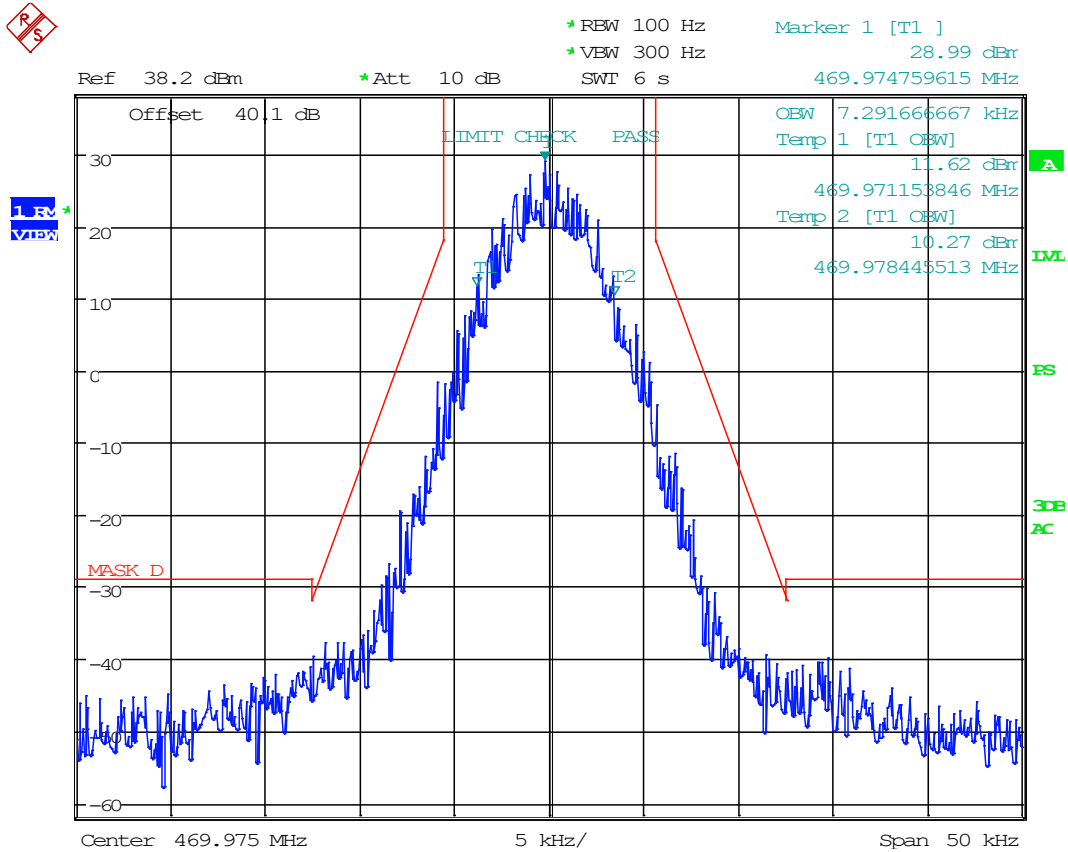
Date: 21.OCT.2021 10:55:32

8.4.10 Emission Mask, 12.5 kHz FM, 469.975 MHz



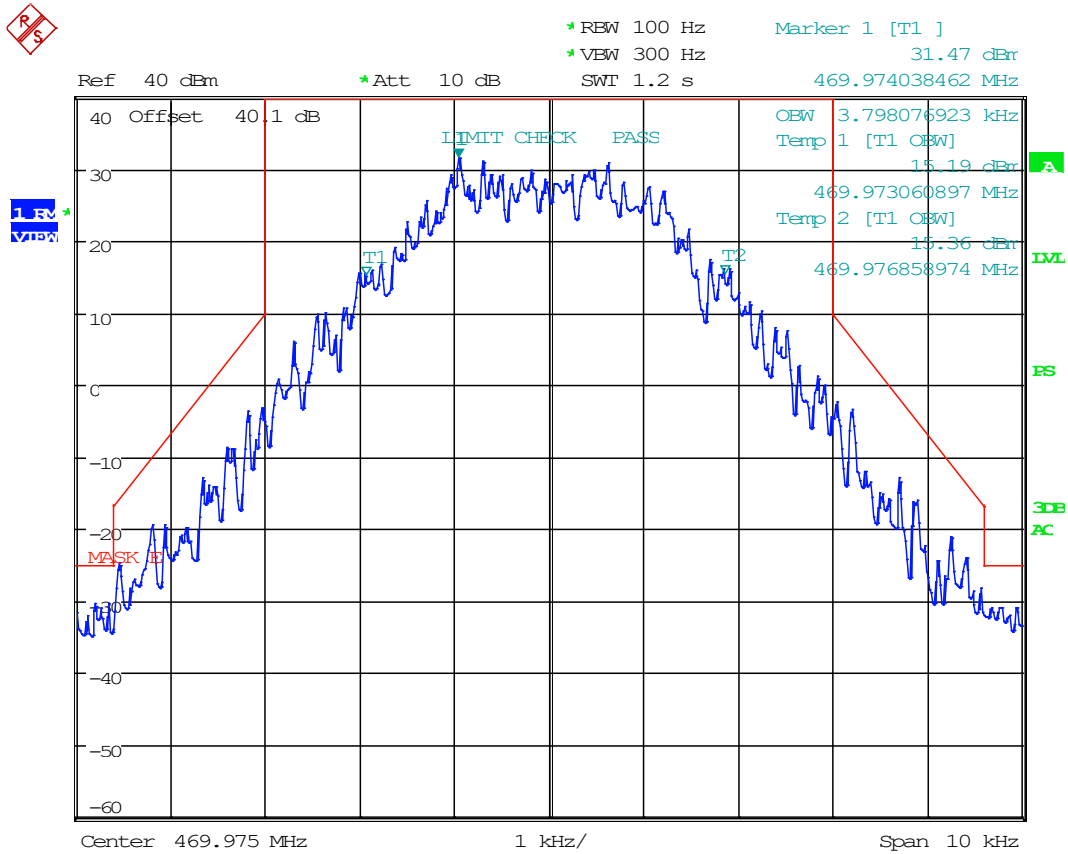
Date: 21.OCT.2021 10:25:37

8.4.11 Emission Mask, 12.5 kHz NXDN, 469.975 MHz



Date: 21.OCT.2021 10:44:41

8.4.12 Emission Mask, 6.25 kHz NXDNSN, 469.975 MHz

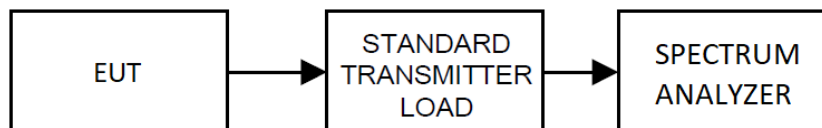


Date: 21.OCT.2021 10:54:44

8.5 Emission Limitations, Out-of-Band

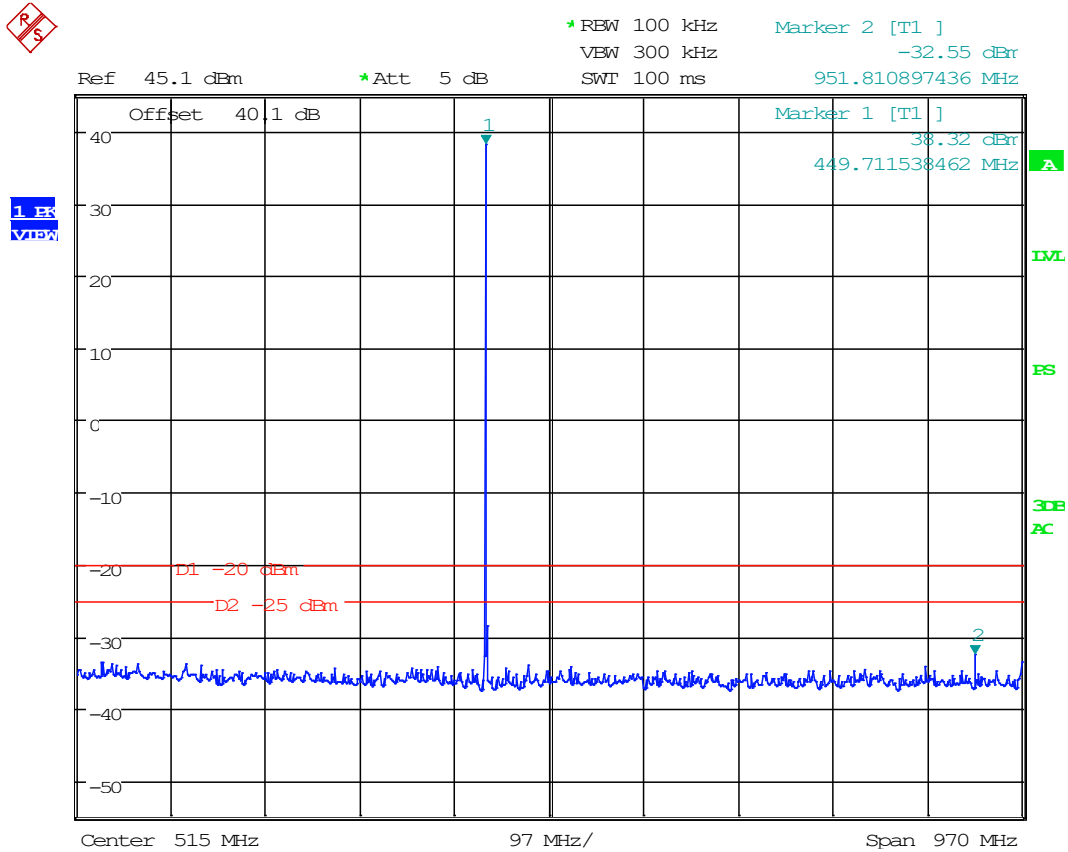
Limits from FCC Parts 2.1051, and 90.210; and test procedure from ANSI C63.26-2015.

Conducted Test Setup



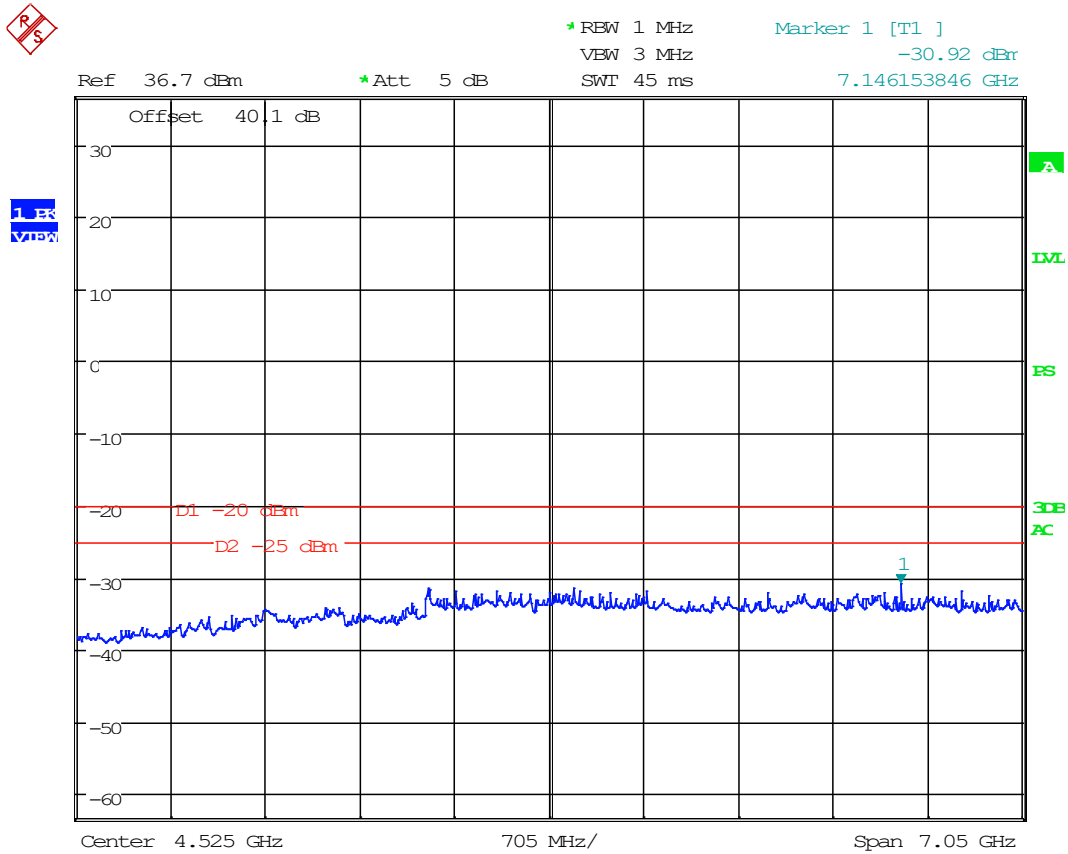
Conducted Emissions Spectrum Plots

8.5.1 Conducted Emissions, Below 1GHz, 450.025 MHz



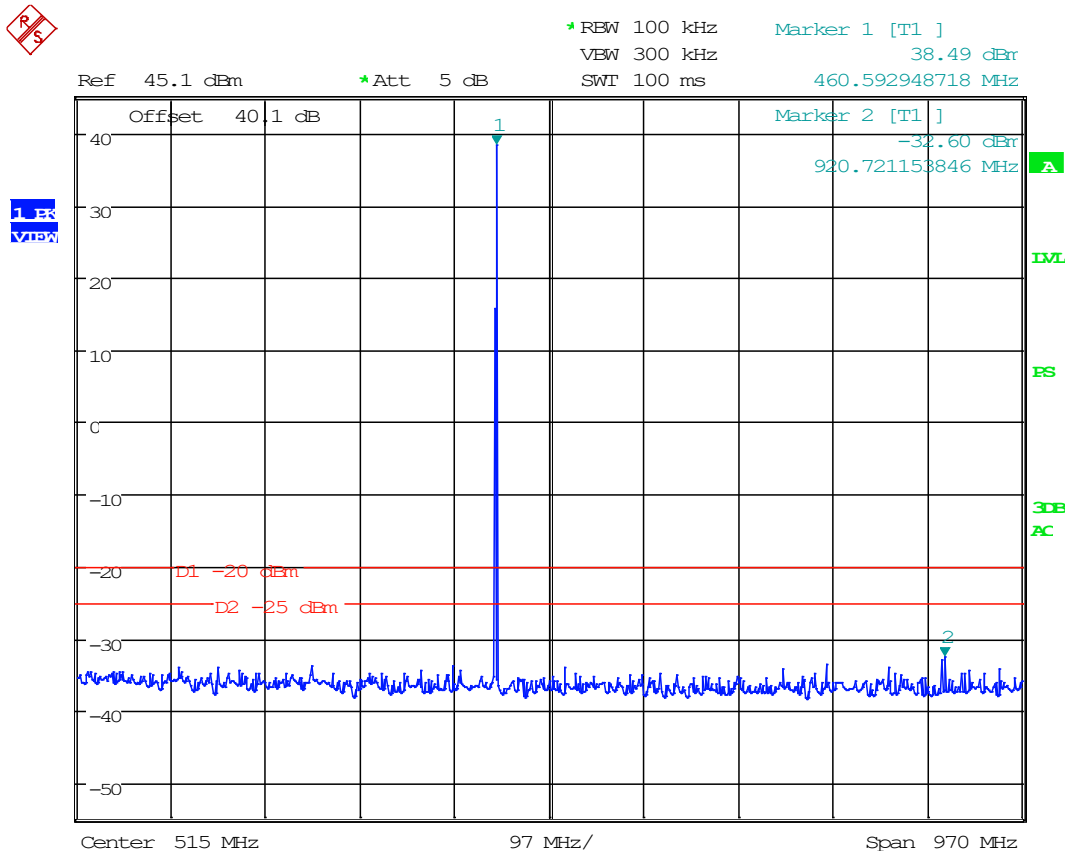
Date: 21.OCT.2021 11:21:37

8.5.2 Conducted Emissions Above 1GHz, 450.025 MHz



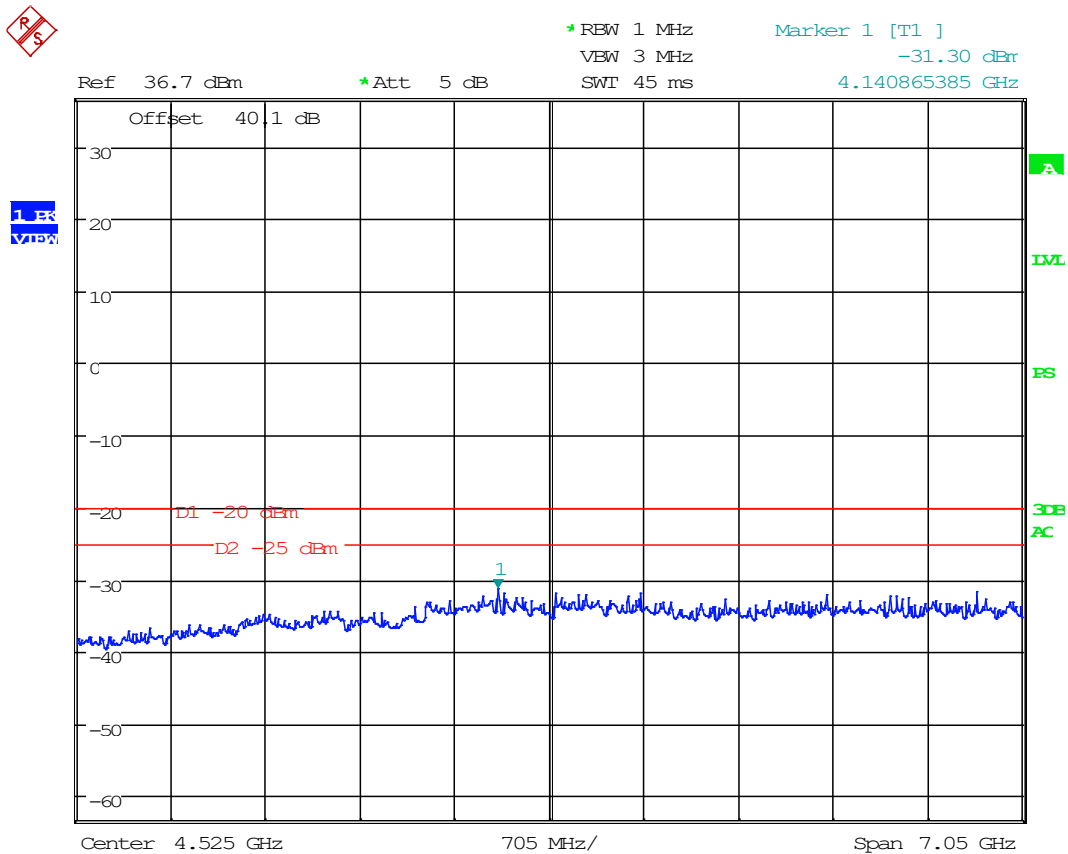
Date: 21.OCT.2021 11:24:16

8.5.3 Conducted Emissions Below 1GHz, 460.025 MHz



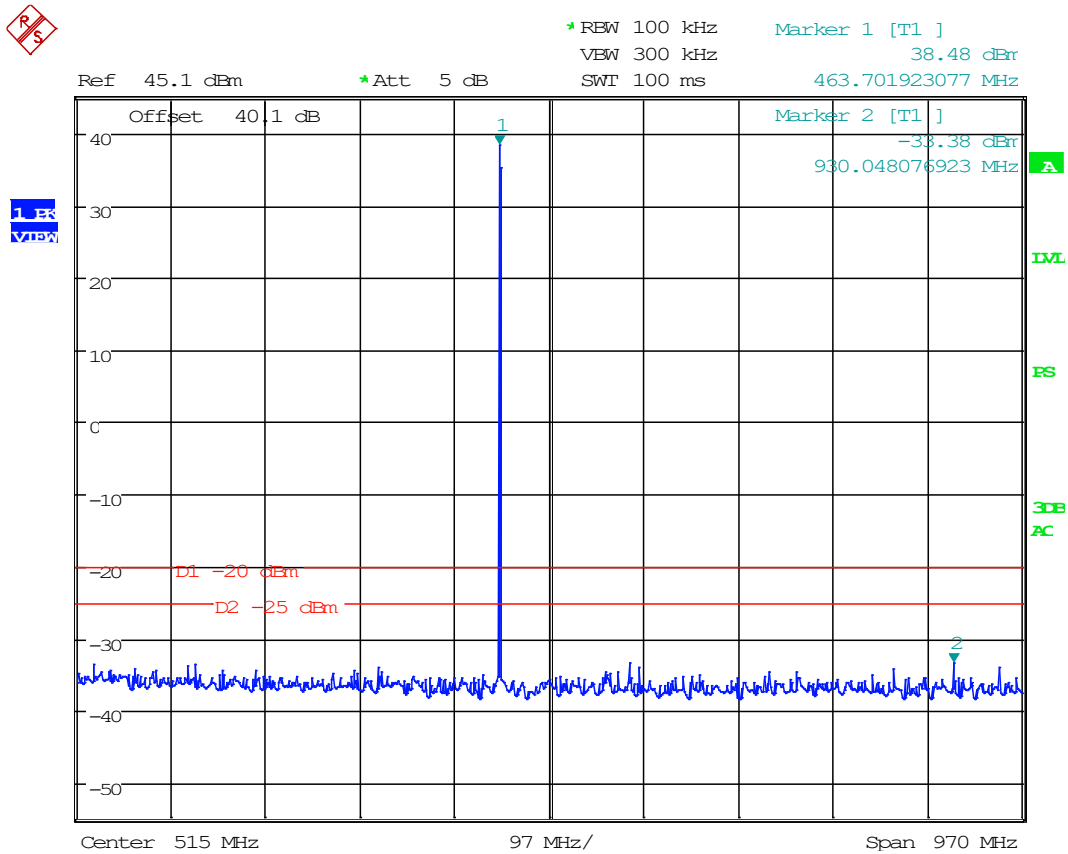
Date: 21.OCT.2021 11:22:12

8.5.4 Conducted Emissions Above 1GHz, 460.025 MHz



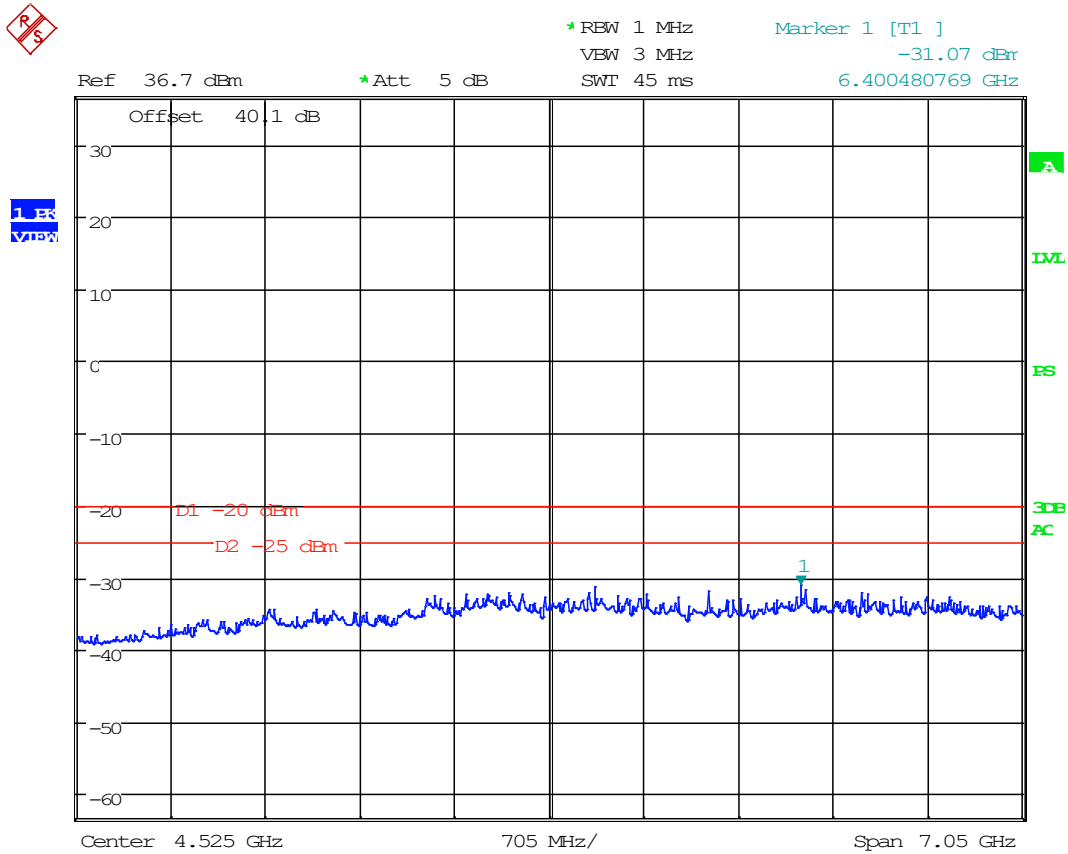
Date: 21.OCT.2021 11:24:41

8.5.5 Conducted Emissions Below 1GHz, 464.5 MHz



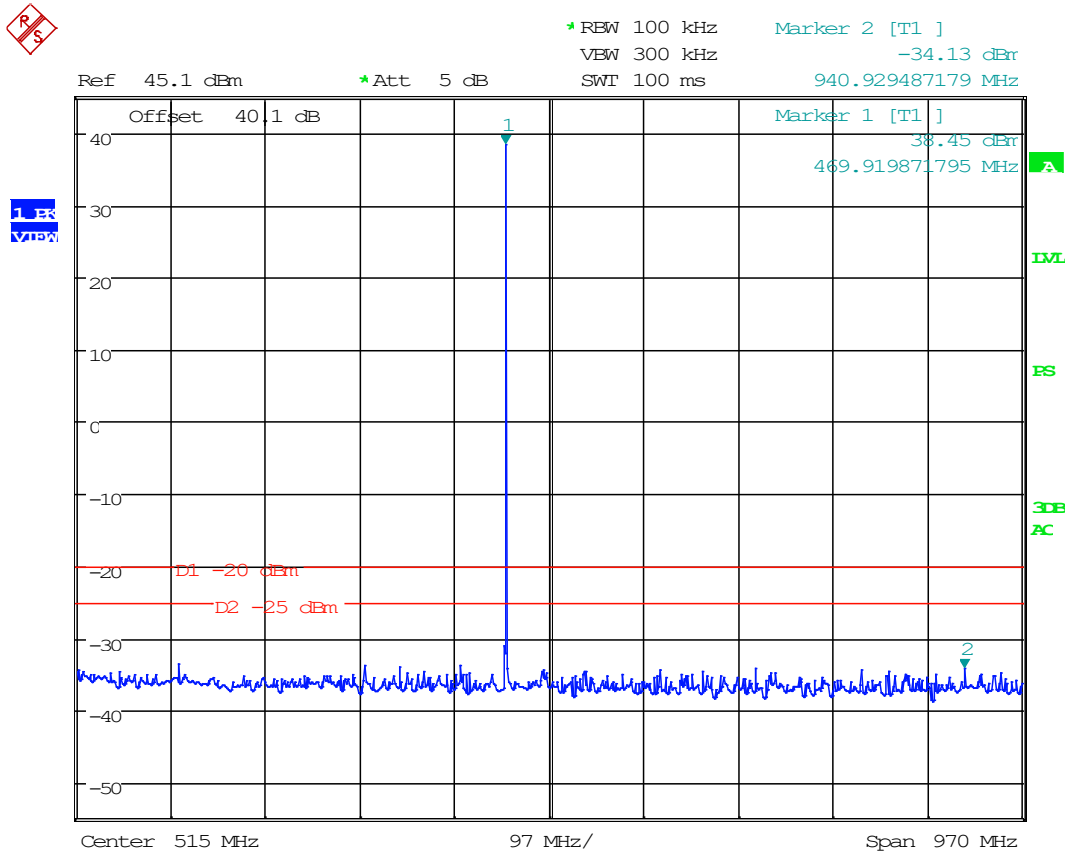
Date: 21.OCT.2021 11:23:15

8.5.6 Conducted Emissions Above 1GHz, 464.5 MHz



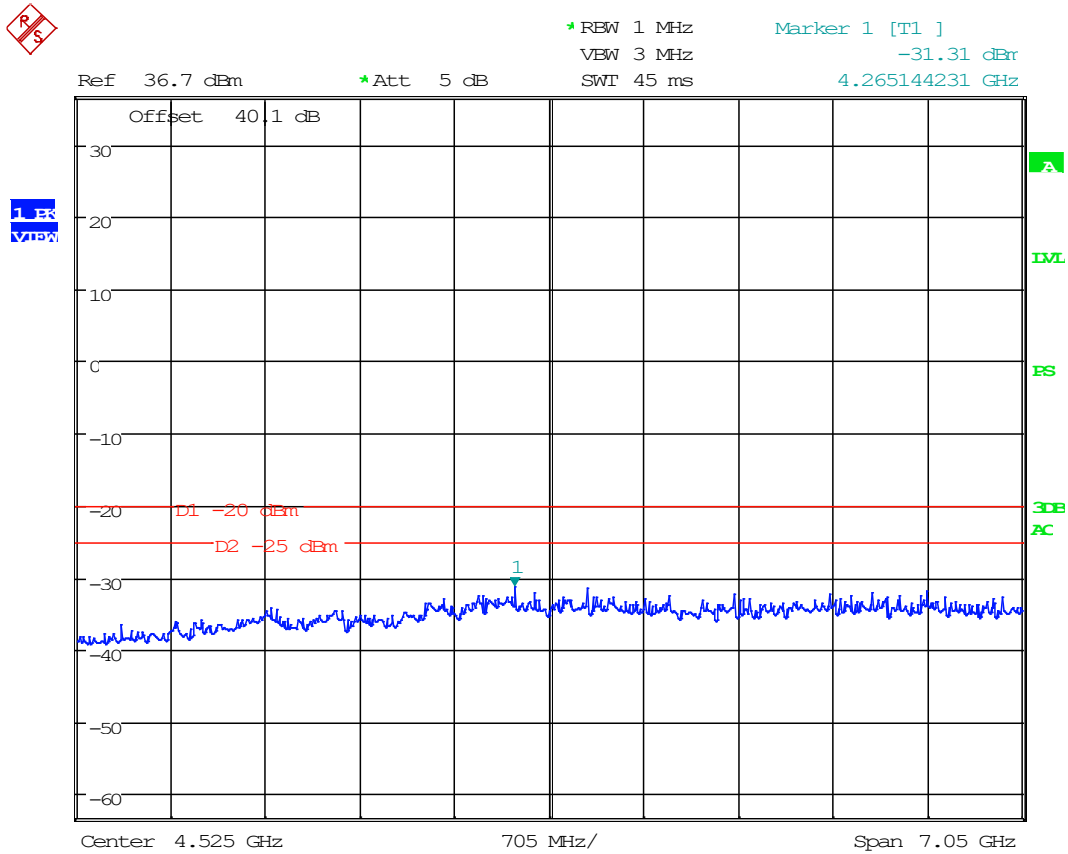
Date: 21.OCT.2021 11:25:28

8.5.7 Conducted Emissions Below 1GHz, 469.975 MHz



Date: 21.OCT.2021 11:22:48

8.5.8 Conducted Emissions Above 1GHz, 469.975 MHz

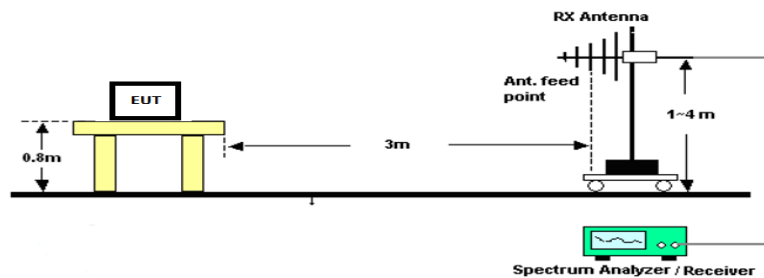


Date: 21.OCT.2021 11:25:04

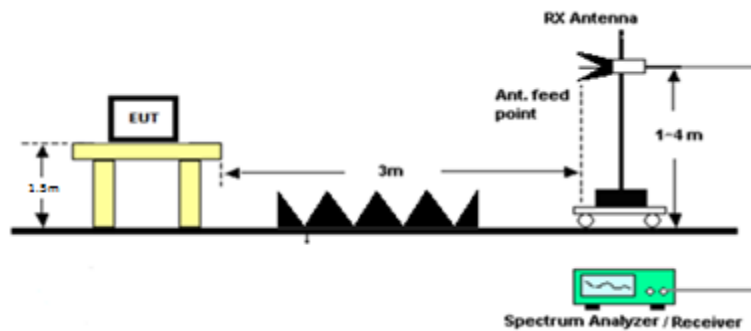
8.6 Radiated Emissions

Limits from FCC Parts 2.1053, 80.211 (f), 87.139 (a), 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

8.6.1 Radiated Emissions, 450.025 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)
450.03	900.05	PK	21.64	H	3.54	21.71	3.00	46.89	-50.49	-25.00	25.49
450.03	900.05	PK	13.50	V	3.54	21.71	3.00	38.75	-58.63	-25.00	33.63
450.03	1350.08	PK	15.70	H	4.26	28.76	3.00	48.72	-48.66	-25.00	23.66
450.03	1350.08	PK	15.44	V	4.26	28.76	3.00	48.46	-48.92	-25.00	23.92
450.03	1800.10	PK	15.27	H	4.90	30.29	3.00	50.46	-46.92	-25.00	21.92
450.03	1800.10	PK	15.86	V	4.90	30.29	3.00	51.05	-46.33	-25.00	21.33
450.03	2250.13	PK	19.67	H	5.43	31.23	3.00	56.33	-41.05	-25.00	16.05
450.03	2250.13	PK	16.10	V	5.43	31.23	3.00	52.76	-44.62	-25.00	19.62
450.03	2700.15	PK	15.24	H	5.98	32.51	3.00	53.72	-43.65	-25.00	18.65
450.03	2700.15	PK	18.53	V	5.98	32.51	3.00	57.01	-40.36	-25.00	15.36
450.03	3150.18	PK	16.22	H	6.53	32.77	3.00	55.52	-41.86	-25.00	16.86
450.03	3150.18	PK	16.50	V	6.53	32.77	3.00	55.80	-41.58	-25.00	16.58
450.03	3600.20	PK	14.91	H	6.67	33.11	3.00	54.68	-42.69	-25.00	17.69
450.03	3600.20	PK	16.91	V	6.67	33.11	3.00	56.68	-40.69	-25.00	15.69
450.03	4050.23	PK	13.87	H	7.19	33.38	3.00	54.43	-42.94	-25.00	17.94
450.03	4050.23	PK	15.07	V	7.19	33.38	3.00	55.63	-41.74	-25.00	16.74
450.03	4500.25	PK	13.75	H	7.33	33.89	3.00	54.96	-42.41	-25.00	17.41
450.03	4500.25	PK	15.15	V	7.33	33.89	3.00	56.36	-41.01	-25.00	16.01

8.6.2 Radiated Emissions, 460.025 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)
460.03	920.05	PK	18.71	H	3.58	22.30	3.00	44.59	-52.79	-25.00	27.79
460.03	920.05	PK	9.47	V	3.58	22.30	3.00	35.35	-62.03	-25.00	37.03
460.03	1380.08	PK	17.92	H	4.30	28.58	3.00	50.80	-46.57	-25.00	21.57
460.03	1380.08	PK	19.57	V	4.30	28.58	3.00	52.45	-44.92	-25.00	19.92
460.03	1840.10	PK	15.45	H	4.96	30.77	3.00	51.17	-46.20	-25.00	21.20
460.03	1840.10	PK	17.52	V	4.96	30.77	3.00	53.24	-44.13	-25.00	19.13
460.03	2300.13	PK	20.30	H	5.49	31.52	3.00	57.31	-40.06	-25.00	15.06
460.03	2300.13	PK	15.72	V	5.49	31.52	3.00	52.73	-44.64	-25.00	19.64
460.03	2760.15	PK	15.05	H	6.11	32.41	3.00	53.57	-43.80	-25.00	18.80
460.03	2760.15	PK	15.80	V	6.11	32.41	3.00	54.32	-43.05	-25.00	18.05
460.03	3220.18	PK	17.68	H	6.63	32.68	3.00	56.99	-40.39	-25.00	15.39
460.03	3220.18	PK	17.97	V	6.63	32.68	3.00	57.28	-40.10	-25.00	15.10
460.03	3680.20	PK	13.76	H	6.62	33.19	3.00	53.58	-43.80	-25.00	18.80
460.03	3680.20	PK	13.30	V	6.62	33.19	3.00	53.12	-44.26	-25.00	19.26
460.03	4140.23	PK	14.78	H	7.04	33.42	3.00	55.24	-42.14	-25.00	17.14
460.03	4140.23	PK	14.70	V	7.04	33.42	3.00	55.16	-42.22	-25.00	17.22
460.03	4600.25	PK	13.25	H	7.55	34.06	3.00	54.85	-42.52	-25.00	17.52
460.03	4600.25	PK	14.21	V	7.55	34.06	3.00	55.81	-41.56	-25.00	16.56

8.6.3 Radiated Emissions, 464.5 MHz

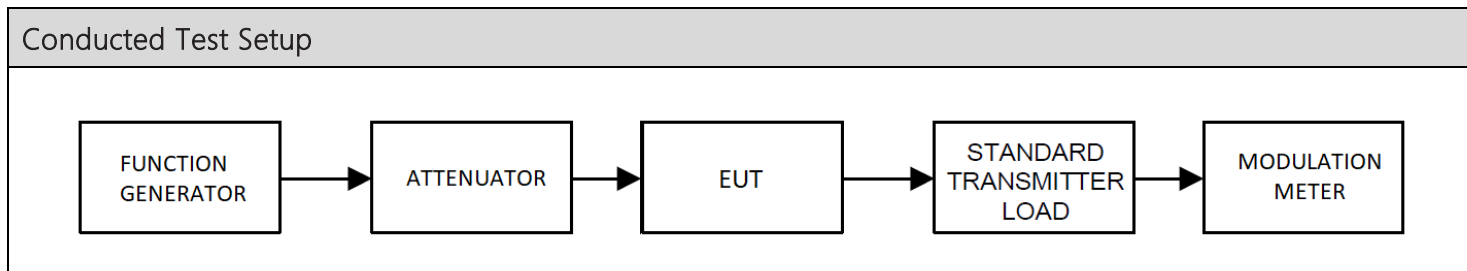
Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
464.50	929.00	PK	14.49	H	3.58	22.28	3.00	40.35	-57.03	-25.00	32.03
464.50	929.00	PK	11.75	V	3.58	22.28	3.00	37.61	-59.77	-25.00	34.77
464.50	1393.50	PK	22.44	H	4.31	28.50	3.00	55.25	-42.13	-25.00	17.13
464.50	1393.50	PK	19.11	V	4.31	28.50	3.00	51.92	-45.46	-25.00	20.46
464.50	1858.00	PK	17.88	H	4.99	30.90	3.00	53.77	-43.61	-25.00	18.61
464.50	1858.00	PK	18.01	V	4.99	30.90	3.00	53.90	-43.48	-25.00	18.48
464.50	2322.50	PK	20.50	H	5.53	31.70	3.00	57.73	-39.65	-25.00	14.65
464.50	2322.50	PK	16.66	V	5.53	31.70	3.00	53.89	-43.49	-25.00	18.49
464.50	2787.00	PK	15.24	H	6.16	32.48	3.00	53.88	-43.50	-25.00	18.50
464.50	2787.00	PK	15.68	V	6.16	32.48	3.00	54.32	-43.06	-25.00	18.06
464.50	3251.50	PK	20.65	H	6.65	32.68	3.00	59.98	-37.40	-25.00	12.40
464.50	3251.50	PK	17.59	V	6.65	32.68	3.00	56.92	-40.46	-25.00	15.46
464.50	3716.00	PK	13.95	H	6.55	33.17	3.00	53.67	-43.71	-25.00	18.71
464.50	3716.00	PK	14.14	V	6.55	33.17	3.00	53.86	-43.52	-25.00	18.52
464.50	4180.50	PK	14.38	H	6.94	33.36	3.00	54.67	-42.70	-25.00	17.70
464.50	4180.50	PK	14.69	V	6.94	33.36	3.00	54.98	-42.39	-25.00	17.39
464.50	4645.00	PK	15.02	H	7.47	33.92	3.00	56.41	-40.97	-25.00	15.97
464.50	4645.00	PK	15.90	V	7.47	33.92	3.00	57.29	-40.09	-25.00	15.09

8.6.4 Radiated Emissions, 469.975 MHz

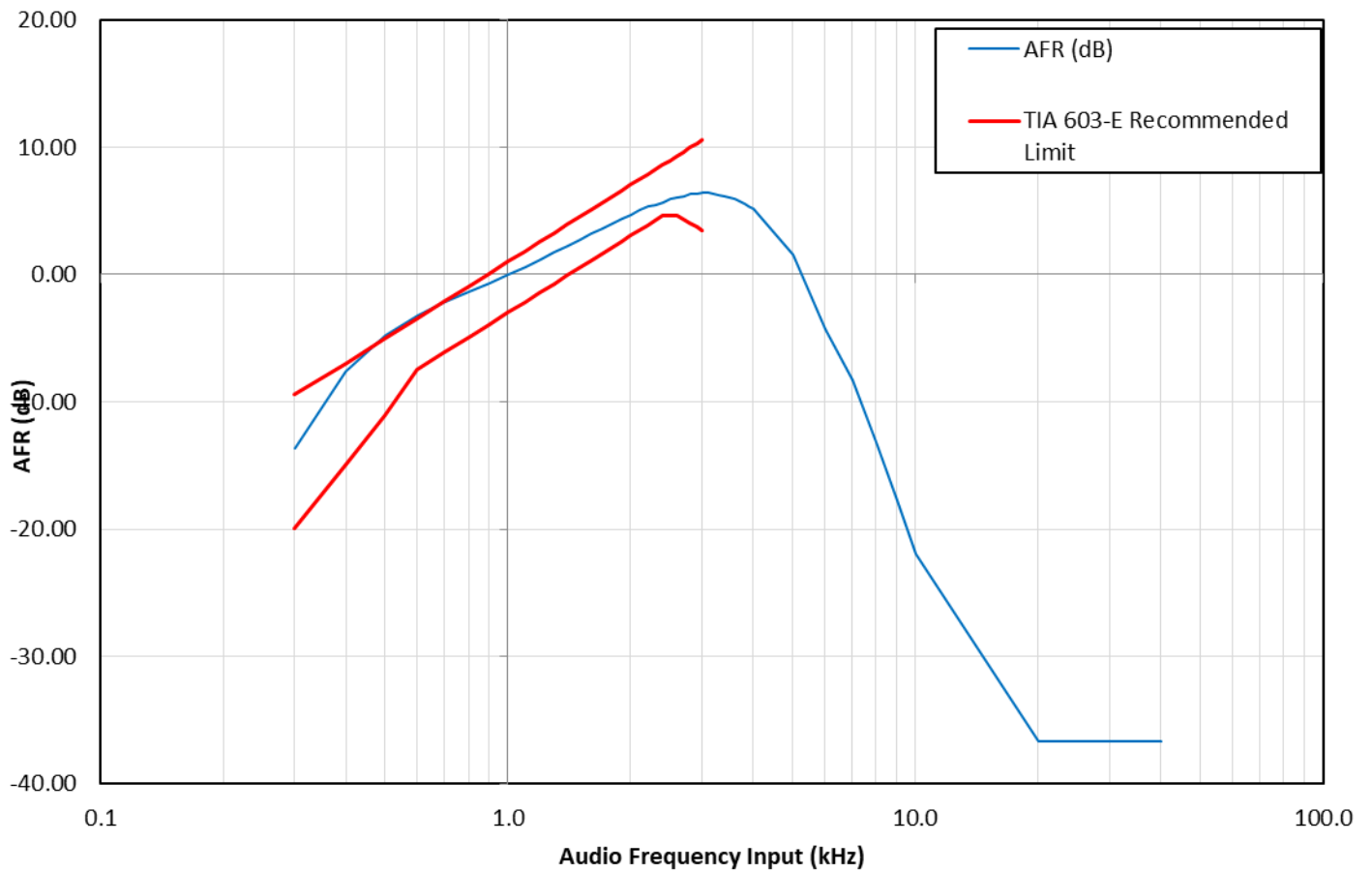
Tuned Frequency (MHz)	Emission Frequency (MHz)	Detector	Meter Reading (dBuV)	Antenna Polarity	Coax Loss (dB)	Antenna Correction Factor (dB/m)	Distance (m)	Field Strength (dBuV/m)	ERP (dBm)	Spurious Limit (dBm)	Margin (dB)
469.98	939.95	PK	20.39	H	3.59	22.60	3.00	46.58	-50.80	-25.00	25.80
469.98	939.95	PK	15.03	V	3.59	22.60	3.00	41.22	-56.16	-25.00	31.16
469.98	1409.93	PK	19.55	H	4.31	28.39	3.00	52.25	-45.13	-25.00	20.13
469.98	1409.93	PK	18.53	V	4.31	28.39	3.00	51.23	-46.15	-25.00	21.15
469.98	1879.90	PK	15.63	H	5.03	30.94	3.00	51.60	-45.77	-25.00	20.77
469.98	1879.90	PK	17.28	V	5.03	30.94	3.00	53.25	-44.12	-25.00	19.12
469.98	2349.88	PK	16.54	H	5.58	31.92	3.00	54.04	-43.34	-25.00	18.34
469.98	2349.88	PK	21.07	V	5.58	31.92	3.00	58.57	-38.81	-25.00	13.81
469.98	2819.85	PK	14.99	H	6.21	32.43	3.00	53.63	-43.75	-25.00	18.75
469.98	2819.85	PK	15.60	V	6.21	32.43	3.00	54.24	-43.14	-25.00	18.14
469.98	3289.83	PK	14.77	H	6.70	32.63	3.00	54.10	-43.28	-25.00	18.28
469.98	3289.83	PK	18.41	V	6.70	32.63	3.00	57.74	-39.64	-25.00	14.64
469.98	3759.80	PK	13.85	H	6.45	33.13	3.00	53.43	-43.95	-25.00	18.95
469.98	3759.80	PK	14.87	V	6.45	33.13	3.00	54.45	-42.93	-25.00	17.93
469.98	4229.78	PK	13.59	H	7.10	33.33	3.00	54.02	-43.36	-25.00	18.36
469.98	4229.78	PK	16.08	V	7.10	33.33	3.00	56.51	-40.87	-25.00	15.87
469.98	4699.75	PK	13.34	H	7.20	33.88	3.00	54.42	-42.96	-25.00	17.96
469.98	4699.75	PK	15.52	V	7.20	33.88	3.00	56.60	-40.78	-25.00	15.78

8.7 Modulation Characteristics

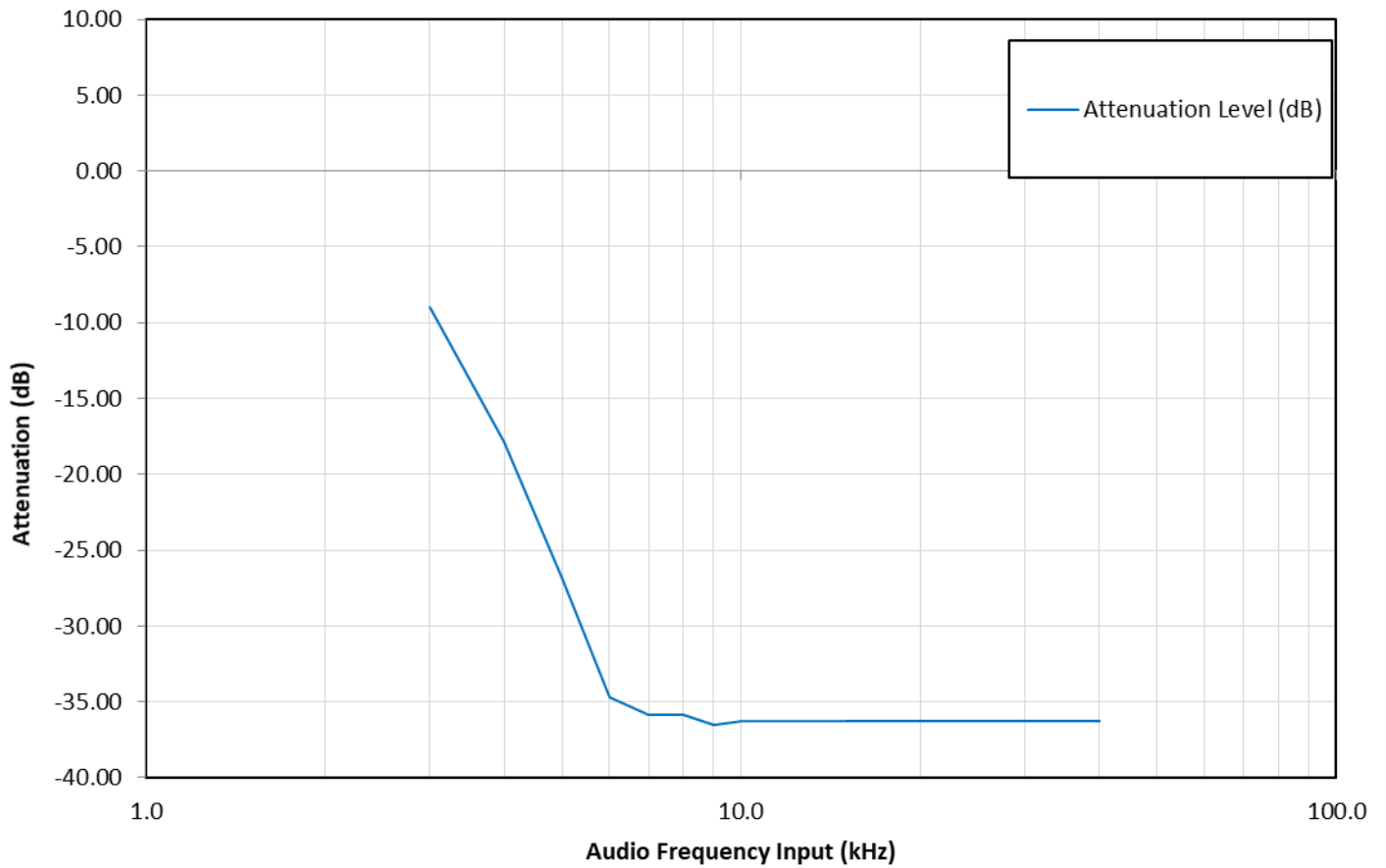
Limits from FCC Parts 2.1047 and test procedure from ANSI C63.26-2015



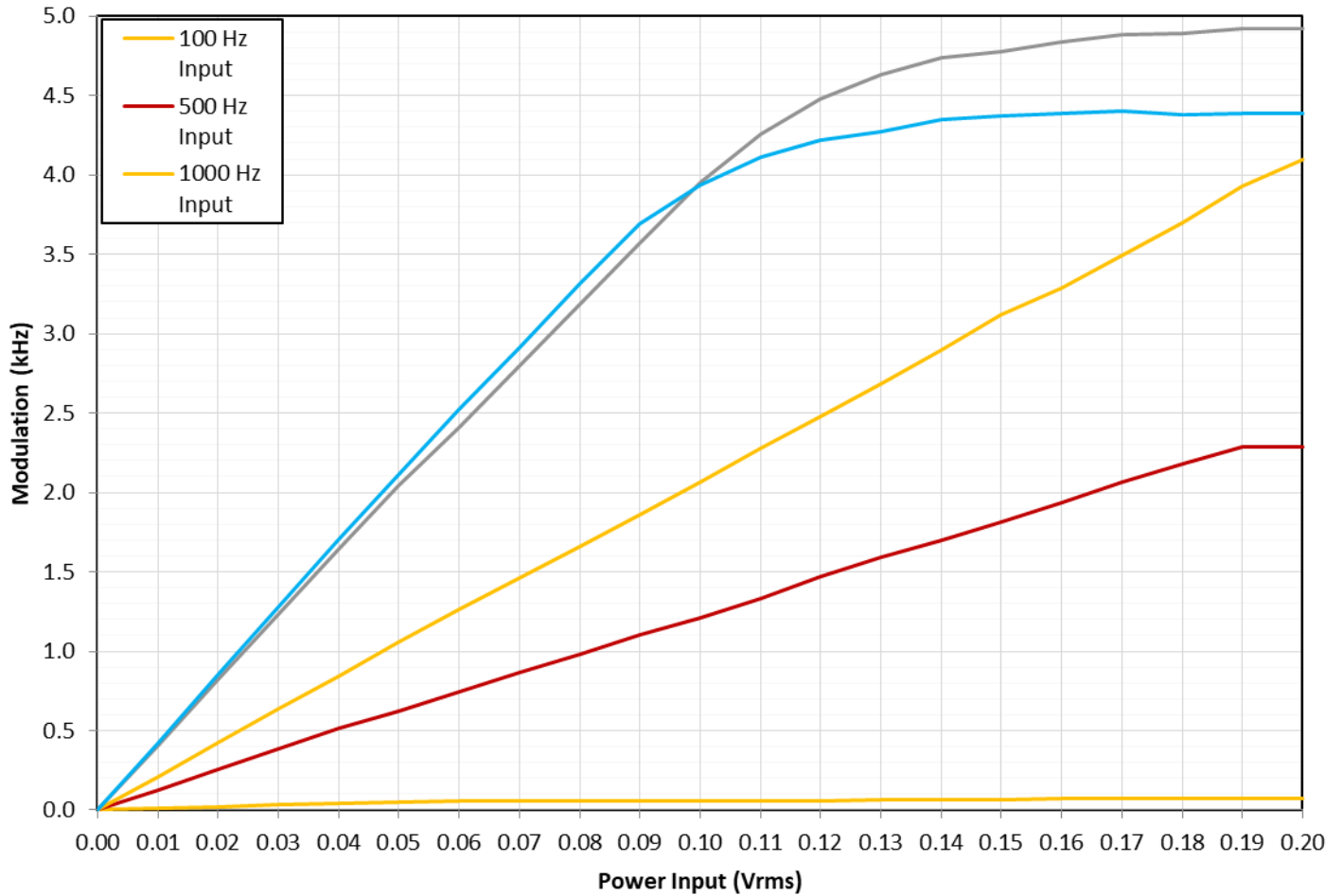
8.7.1 Audio Frequency Response



8.7.2 Low Pass Filter Response

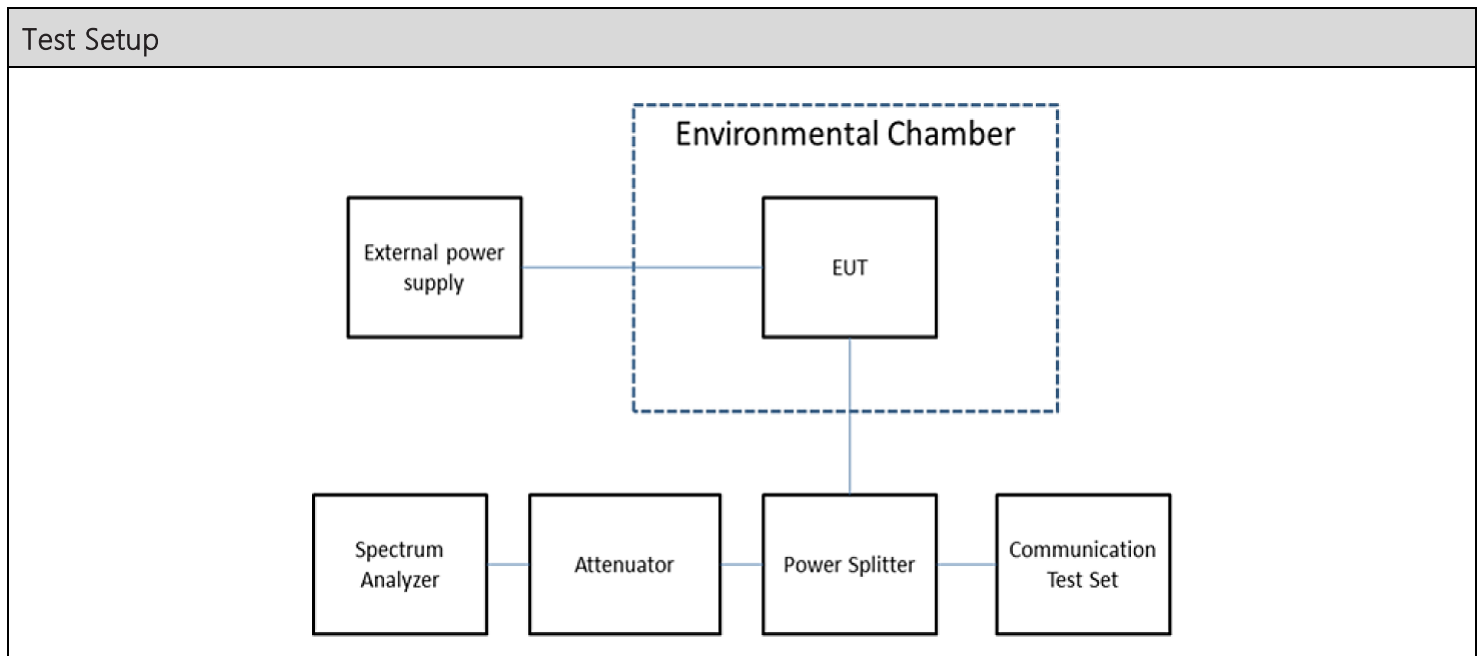


8.7.3 Modulation Limiting



8.8 Frequency Stability

Limits from FCC Parts 2.1055, and 90.213; and test procedure from ANSI C63.26-2015.



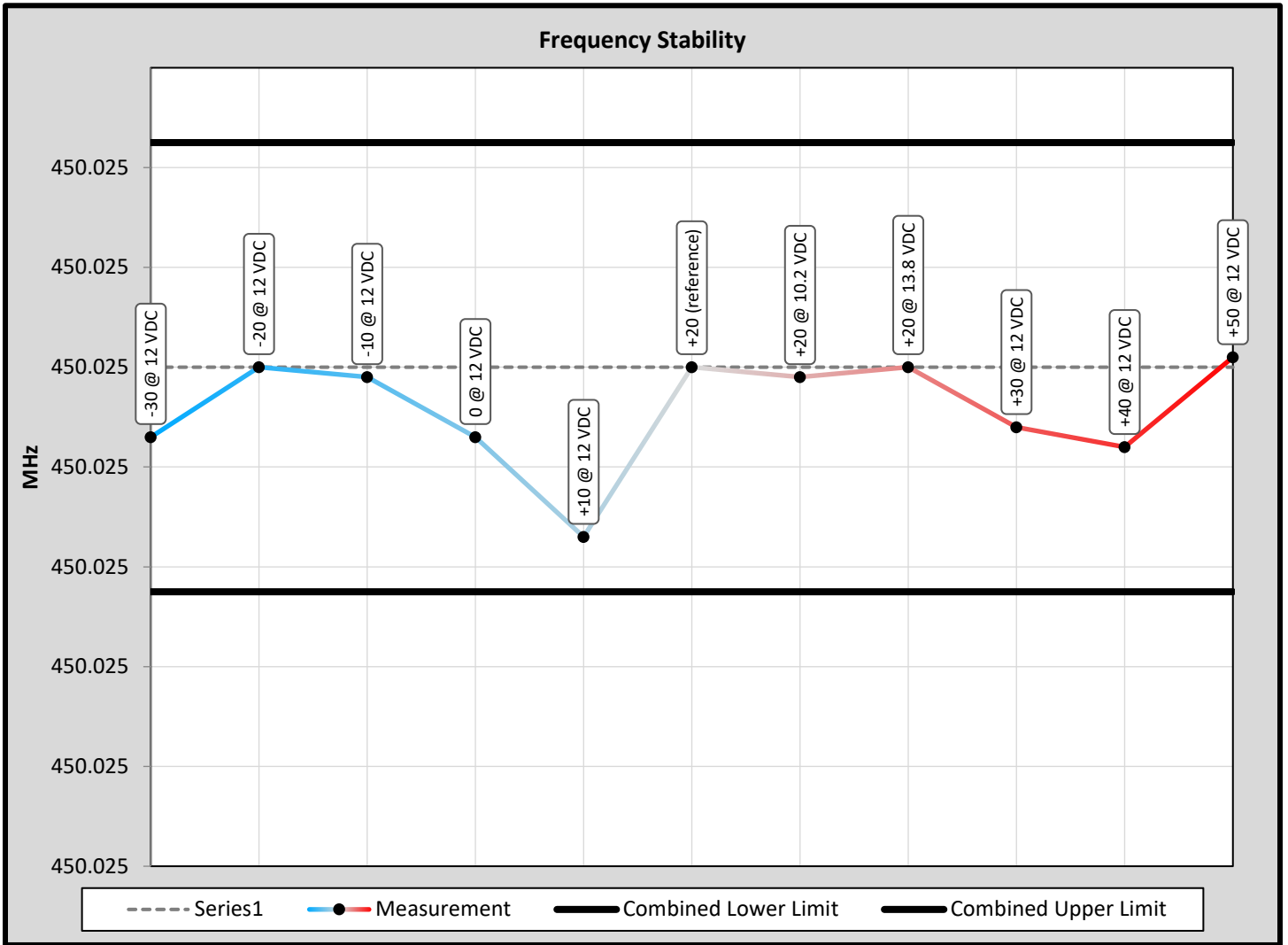
Test Results, Mode 1		
Tuned Frequency (MHz)	Max Deviation (kHz)	Limit (ppm)
450.025	0.170	0.5

Frequency Stability, Tabular Data

8.8.1 Frequency Stability Data

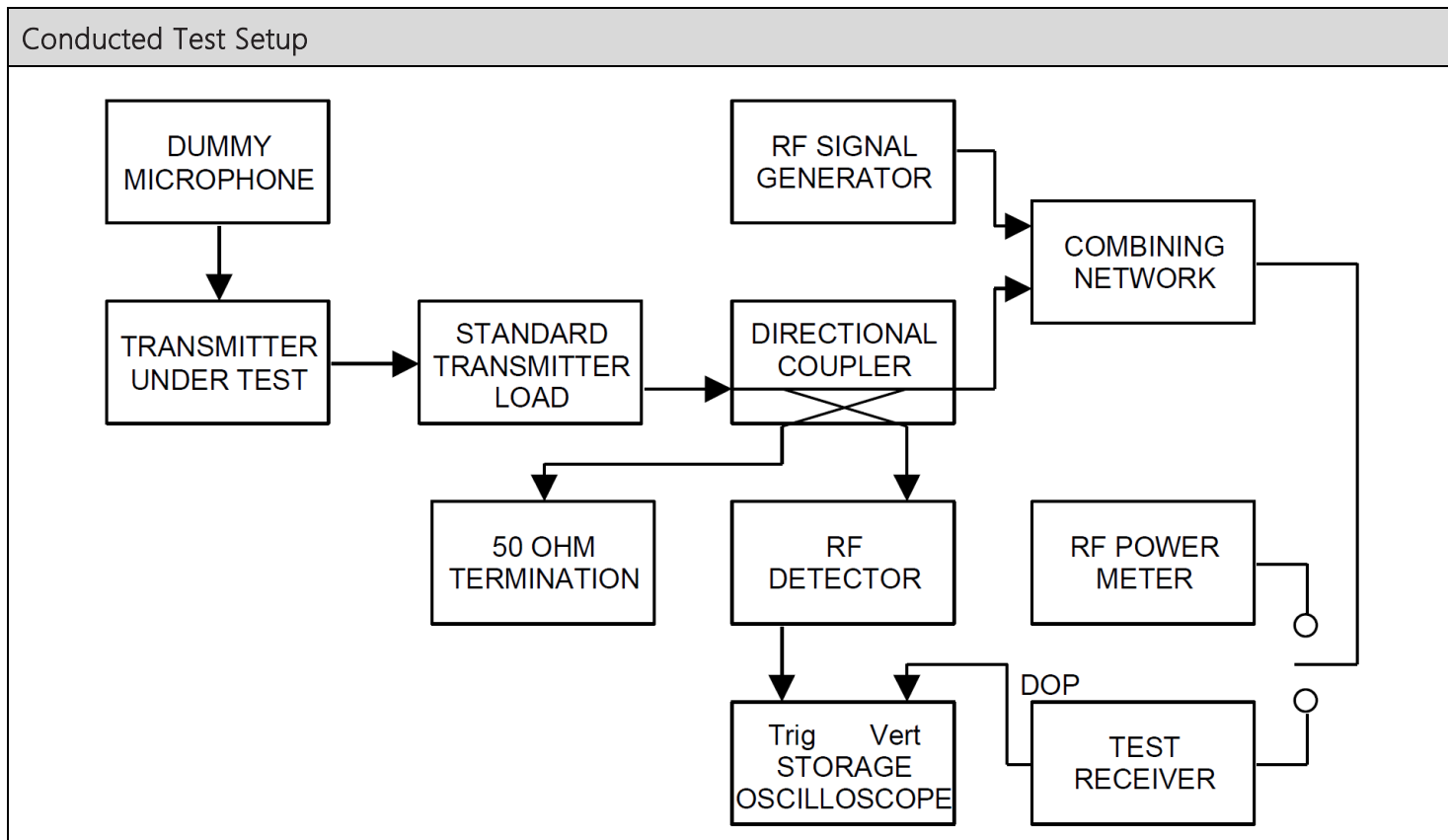
FCC Part 90 Limit	0.5	ppm	
FCC Part 90 Limit, as ppb	500	ppb (Parts per Billion)	
FCC Part 90 Limit, as %	0.00005	%	
Strictest Combined Limit, as Hz	225.013	Hz	
Combined Lower Limit	450.024775	MHz	
Combined Upper Limit	450.025225	MHz	
Rated Supply Voltage	12.0	☐ AC ☒ DC	
Temperature / Voltage Variation			
Temperature (°C)	Supplied Voltage (V)	Frequency (MHz)	Deviation (kHz)
-30	12.0	450.024930	0.070
-20	12.0	450.025000	0.000
-10	12.0	450.024990	0.010
0	12.0	450.024930	0.070
+10	12.0	450.024830	0.170
+20 (reference)	12.0	450.025000	0.000
+20	10.2	450.024990	0.010
+20	13.8	450.025000	0.000
+30	12.0	450.024940	0.060
+40	12.0	450.024920	0.080
+50	12.0	450.025010	-0.010

8.8.2 Frequency Stability Plot



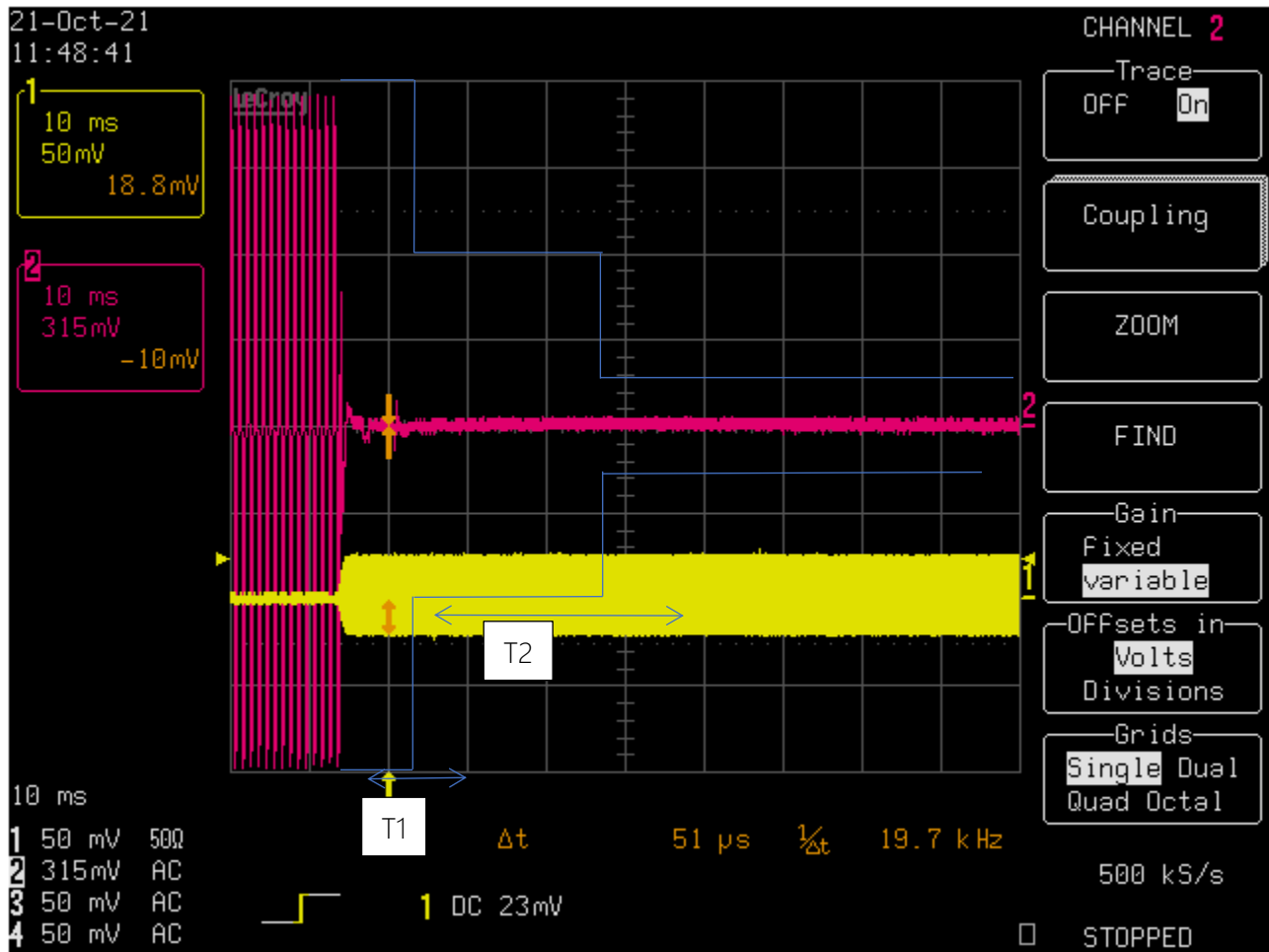
8.9 Transient Frequency Behavior

Limits from FCC Part 90.214; and test procedure from ANSI C63.26-2015.

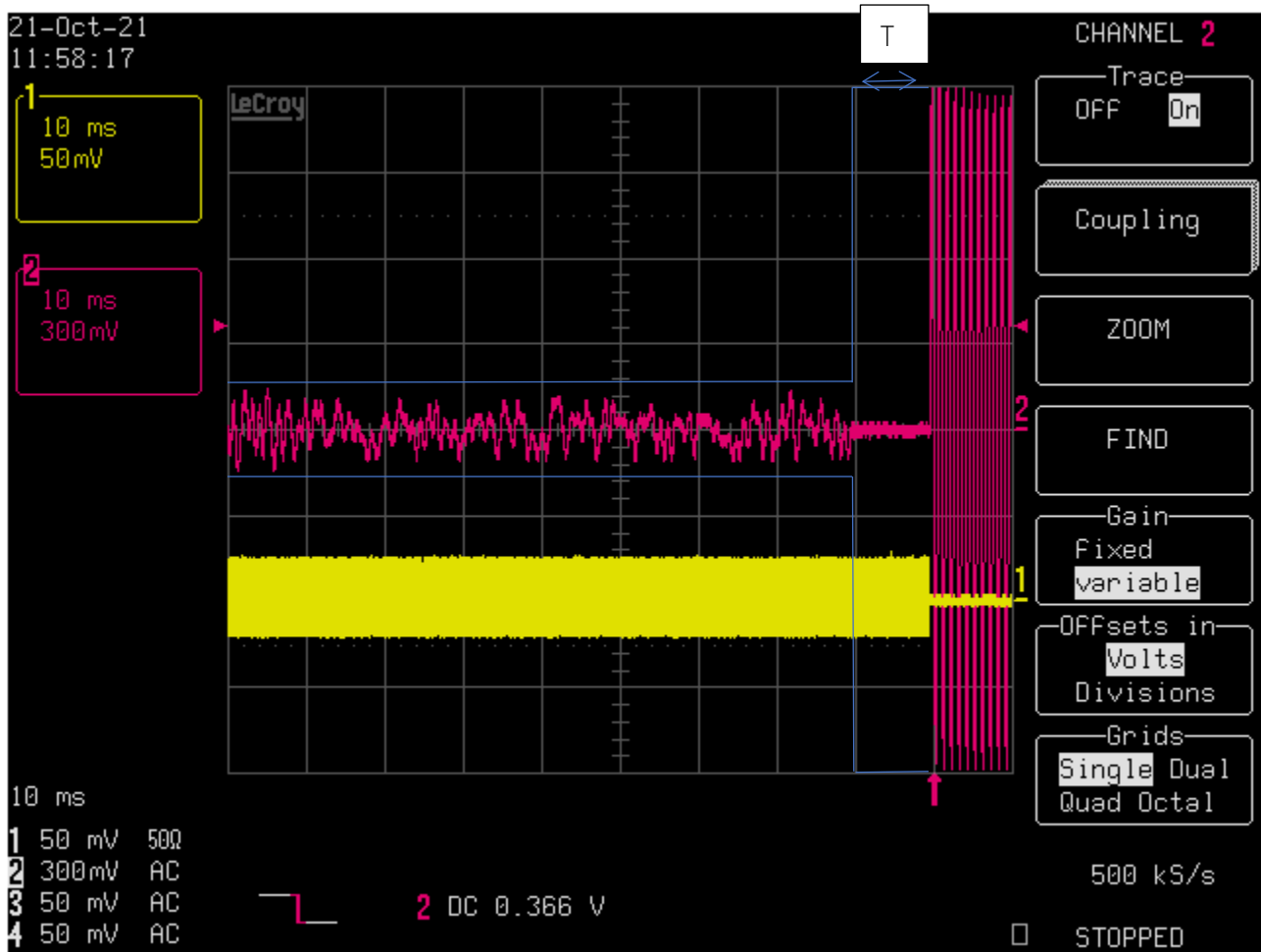


Test Result: Pass

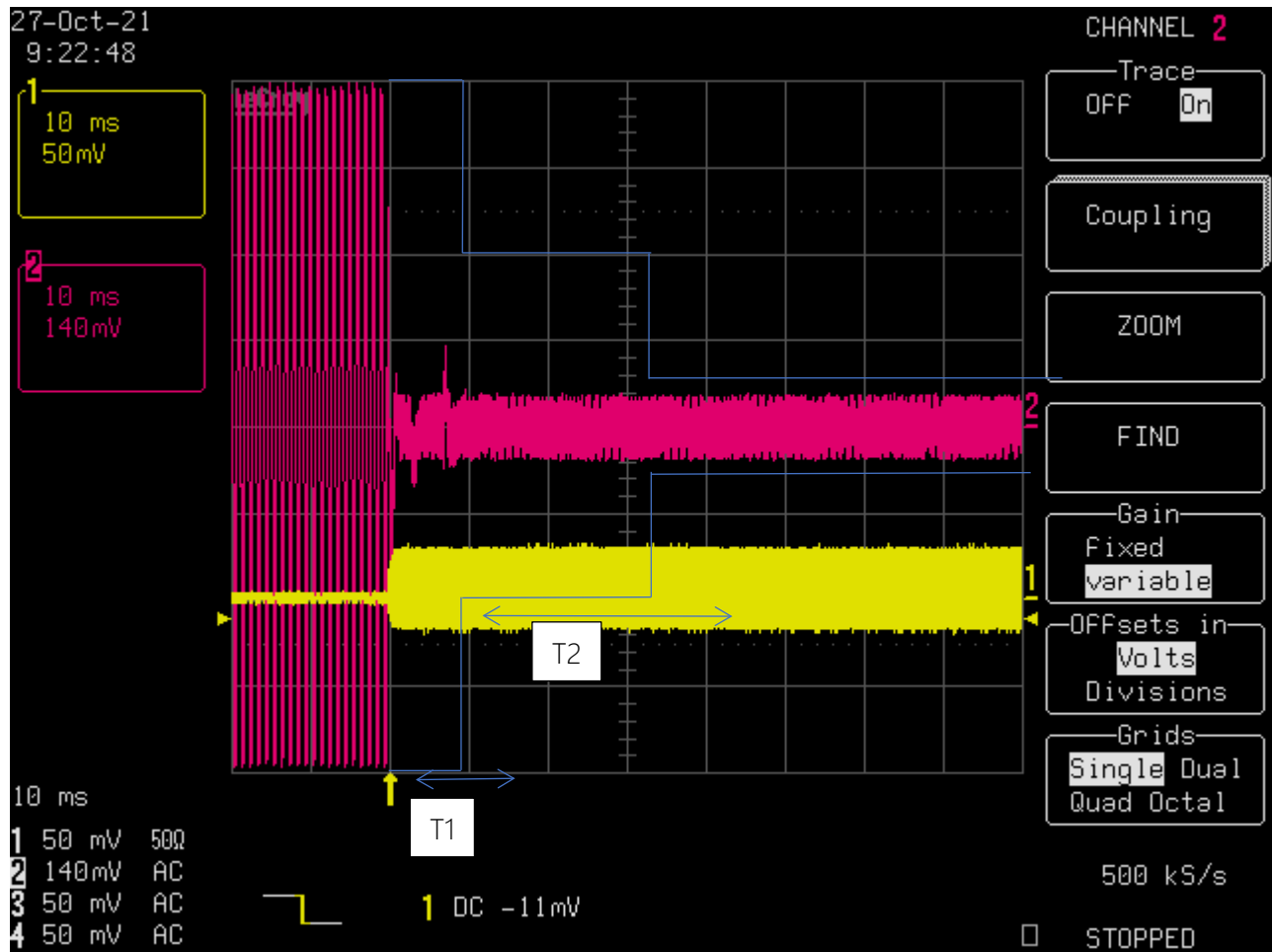
8.9.1 Transient Frequency Behavior, 12.5 kHz FM, Keyed-on



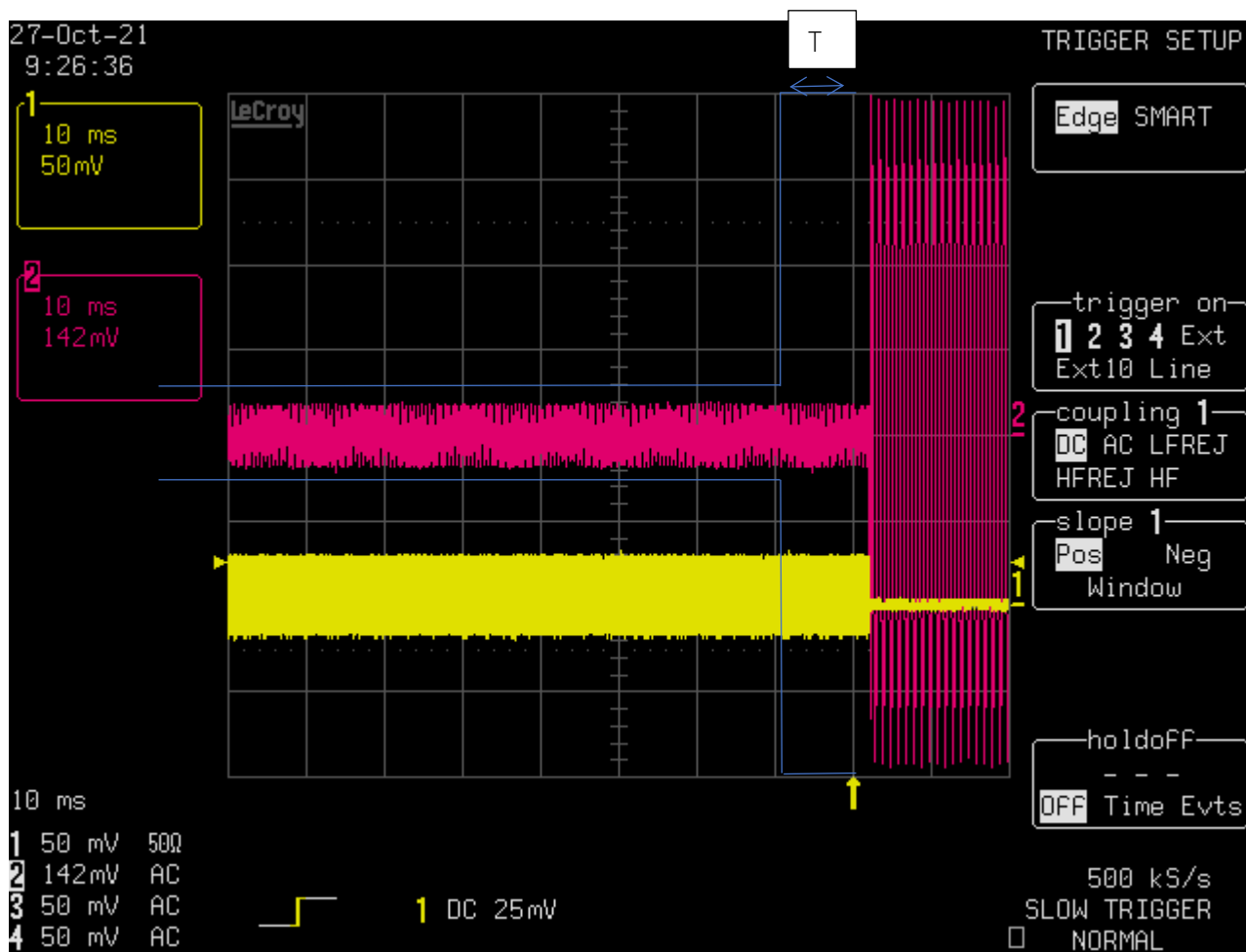
8.9.2 Transient Frequency Behavior, 12.5 kHz FM, Keyed-off



8.9.3 Transient Frequency Behavior, 6.25 kHz FM, Keyed-on



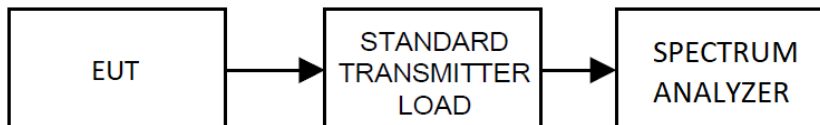
8.9.4 Transient Frequency Behavior, 6.25 kHz FM, Keyed-off



8.10 Adjacent channel power limits

Limits from FCC Part 90.221, and test procedure from ANSI C63.26-2015.

Conducted Test Setup



n/a. The EUT does not operate in a band requiring ACP.

9. ANNEX-A - Photographs of the EUT

Photographs of the EUT and any manufacturer supplied accessories to be used with the EUT are in separate supplementary documents labelled EXTERNAL PHOTOS and INTERNAL PHOTOS.

10. ANNEX-B – Test Setup Photographs

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

11. History of Test Report Changes

Test Report #	Revision #	Description	Date of Issue
TR_5278-21_FCC_PT90_	1	Initial release	10/27/2021

END OF TEST REPORT
