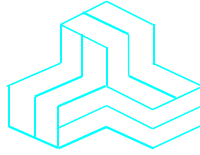


ENGINEERING TEST REPORT



VHF Air Band Transceiver
Model: IC-A16
FCC ID: AFJ405210

Applicant:

ICOM Incorporated
1-1-32, Kamiminami, Hirano-ku
Osaka, Japan, 547-0003

Tested in Accordance With

Federal Communications Commission (FCC)
47 CFR, Parts 2 and 87 (Subpart D)

UltraTech's File No.: 21ICOM551_FCC87

This Test report is Issued under the Authority of
Tri M. Luu
Vice President of Engineering
UltraTech Group of Labs

Date: October 22, 2021

Report Prepared by: Dan Huynh

Tested by: Nimisha Desai

Issued Date: October 22, 2021

Test Dates:
September 29 - 30, 2021
October 1, 4 & 5, 2021

- The results in this Test Report apply only to the sample(s) tested, and the sample tested is randomly selected.
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CA0001-2049



AT-1945



SL2-IN-E-1119R



Korea KCC-RRR

CA0001

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EXHIBIT 1. INTRODUCTION

1.1. SCOPE

Reference:	FCC Parts 2 and 87
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication – Parts 2 & 87
Purpose of Test:	FCC Equipment Authorization Certification for Part 87 Subpart D – Aviation Services operating in the following frequency band: 118.00 to 136.99166 MHz
Test Procedures:	• ANSI C63.26-2015 • ANSI C63.4

1.2. RELATED SUBMITTAL(S)/GRANT(S)

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2021	Code of Federal Regulations, Title 47 – Telecommunication
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
ANSI/TIA-603-E	2016	Land Mobile FM or PM Communications Equipment Measurement and Performance Standards
ANSI C63.26	2015	American National Standard for Compliance Testing of Transmitters Used in Licensed Radio Services

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EXHIBIT 2. PERFORMANCE ASSESSMENT

2.1. CLIENT INFORMATION

Applicant	
Name:	Icom Incorporated
Address:	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
Contact Person:	Mr. Atsushi Tomiyama Phone #: +81 6 6793 8424 Fax #: +81 6 6793 3336 Email Address: world_support@icom.co.jp

Manufacturer	
Name:	Icom Incorporated
Address:	1-1-32, Kamiminami Hirano-ku, Osaka Japan, 547-0003
Contact Person:	Mr. Atsushi Tomiyama Phone #: +81 6 6793 8424 Fax #: +81 6 6793 3336 Email Address: world_support@icom.co.jp

2.2. EQUIPMENT UNDER TEST (EUT) INFORMATION

The following information (with the exception of the Date of Receipt) has been supplied by the applicant.

Brand Name:	ICOM Incorporated
Product Name:	VHF Air Band Transceiver
Model Name or Number:	IC-A16
Serial Number:	603
Type of Equipment:	Non-broadcast Radio Communication Equipment
Power Supply Requirement:	7.2 VDC nominal
Transmitting/Receiving Antenna Type:	Non-Integral
Primary User Functions of EUT:	VHF air band transceiver for voice communication in Occupational environment.

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Portable
Intended Operating Environment:	Commercial, industrial or business environment
Power Supply Requirement:	7.2 VDC standard
RF Output Power Rating:	6.0W (PEP), 1.8 W (CW)
Operating Frequency Range:	118.000-136.99166 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	25.0 kHz / 8.33 kHz
Modulation Employed:	AM
Emission Designator*:	6K00A3E, 5K60A3E
Antenna Connector Type:	BNC

* For an average case of commercial telephony, the Necessary Bandwidth is calculated as follows:

Calculation of Necessary Bandwidth for Telephony (Commercial Quality)

Telephony, double-sideband (single channel):

$$B_n = 2M$$

Where: B_n = Necessary bandwidth in hertz
 M = Maximum modulation frequency in hertz

$$M = 3000\text{Hz}$$

$$B_n = 2(3000) = 6000 \text{ Hz} = 6.00 \text{ KHz}$$

Emission Designator: 6K00A3E

2.4. LIST OF EUT'S PORTS

Port Number	EUT's Port Description	Number of Identical Ports	Connector Type	Cable Type (Shielded/Non-shielded)
1	Antenna	1	BNC	Shielded
2	Headset Jack	1	2.5mm & 3.5mm plug	Non-Shielded

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2.5. ANCILLARY EQUIPMENT

Ancillary Equipment # 1	
Description:	Speaker Microphone
Brand name:	Icom
Model Name or Number:	HM 240
Connected to EUT's Port:	Headset Jack

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EXHIBIT 3. EUT OPERATING CONDITIONS AND CONFIGURATIONS DURING TESTS

3.1. CLIMATE TEST CONDITIONS

The climate conditions of the test environment are as follows:

Temperature:	21°C - 24°C
Humidity:	30% - 57%
Pressure:	102 kPa
Power input source:	7.2 VDC

3.2. OPERATIONAL TEST CONDITIONS & ARRANGEMENT FOR TEST SIGNALS

Operating Modes:	The transmitter was operated in a continuous transmission mode with the carrier modulated as specified in the Test Data.
Special Test Software:	N/A
Special Hardware Used:	Test jig was provided by the manufacturer.
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ω Load.

Transmitter Test Signals	
Frequency Band(s):	118.000-136.99166 MHz
Test Frequency(ies):	118.030, 127.530 and 136.980 MHz (8.33kHz Ch Spacing) 118.025, 127.525 and 136.975 MHz (25 kHz Ch Spacing)
Transmitter Wanted Output Test Signals:	
• Transmitter Power (measured maximum output power):	32.49 dBm (1.77 W)
• Normal Test Modulation:	AM or 2500 Hz tone at an input level 16 dB greater than that necessary to produce 50 percent modulation
• Modulating signal source:	External

EXHIBIT 4. SUMMARY OF TEST RESULTS

4.1. LOCATION OF TESTS

All of the measurements described in this report were performed at Ultratech Group of Labs located in the city of Oakville, Province of Ontario, Canada.

Radiated Emissions were performed at the Ultratech's 3-10 TDK Semi-Anechoic Chamber situated in the Town of Oakville, province of Ontario. This test site been calibrated in accordance with ANSI C63.4, and found to be in compliance with the requirements of Sec. 2.948 of the FCC Rules. The descriptions and site measurement data of the Oakville 3-10 TDK Semi-Anechoic Chamber has been filed with ANAB File No.: AT-1945.

4.2. APPLICABILITY & SUMMARY OF EMC EMISSION TEST RESULTS

FCC Section(s)	Test Requirements	Applicability (Yes/No)
2.1046 & 87.131	RF Power Output	Yes
2.1047(a) & 87.141(f)	Modulation Characteristics - Audio Frequency Response	Yes
2.1047(b) & 87.141	Modulation Characteristics - Modulation Limiting	Yes
2.1049, 87.135, 87.137 & 87.139	Occupied Bandwidth and Emission Limitations	Yes
2.1051, 2.1057 & 87.139	Spurious Emissions at Antenna Terminals	Yes
2.1053, 2.1057 & 87.139	Field Strength of Spurious Radiation	Yes
2.1055 & 87.133	Frequency Stability	Yes
1.1307, 1.1310 & 2.1093	Radiofrequency Radiation Exposure Evaluation	Yes*

* Refer to SAR report.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None.

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EXHIBIT 5. TEST DATA

5.1. RF POWER OUTPUT [§§ 2.1046 & 87.131]

5.1.1. Limits

The following table lists authorized emissions and maximum power. Power must be determined by direct measurement.

Class of station	Frequency band/ frequency	Authorized emission(s) ²	Maximum power ¹
Aeronautical advisory	VHF	A3E	10 watts ³
Aeronautical multicom	VHF	A3E	10 watts
Aeronautical search and rescue	VHF	A3E	10 watts
Aeronautical utility mobile	VHF	A3E	10 watts

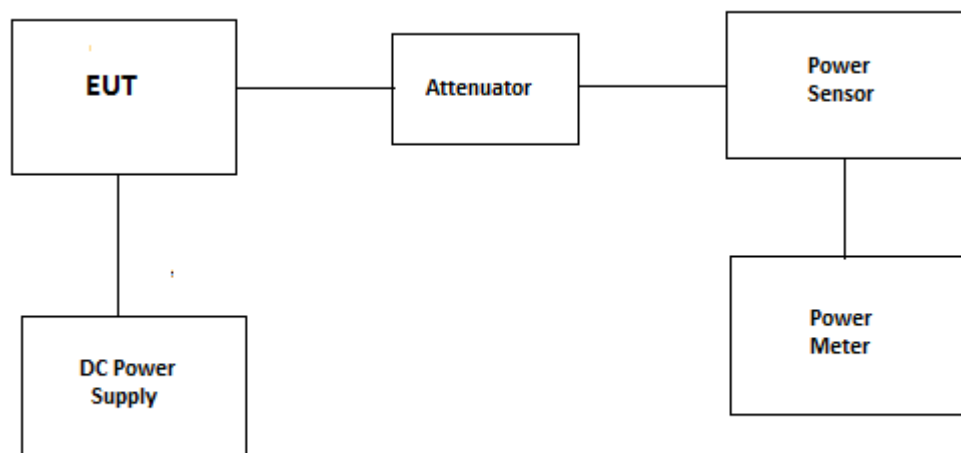
Notes:

- (1) The power is measured at the transmitter output terminals and the type of power is determined according to the emission designator as follows:
 - (i) Mean power (pY) for amplitude modulated emissions and transmitting both sidebands using unmodulated full carrier.
 - (ii) Peak envelope power (pX) for all emission designators other than those referred to in paragraph (i) of this note.
- (2) Excludes automatic link establishment.
- (3) Power is limited to 0.5 watt, but may not exceed 2 watts when station is used in an automatic unattended mode.

5.1.2. Method of Measurements

ANSI C63.26 Section 5.2.

5.1.3. Test Arrangement



5.1.4. Test Data

Channel	Frequency (MHz)	Channel Spacing	Power Rating		Measured Power	
			(W)	(dBm)	(dBm)	(W)
1	118.030	8.33	1.8	32.55	32.45	1.76
2	127.530	8.33	1.8	32.55	32.39	1.73
3	136.980	8.33	1.8	32.55	32.49	1.77
4	118.025	25	1.8	32.55	32.46	1.76
5	127.525	25	1.8	32.55	32.40	1.74
6	136.975	25	1.8	32.55	32.49	1.77

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5.2. MODULATION CHARACTERISTICS – AUDIO FREQUENCY RESPONSE [§§ 2.1047(a) & 87.141(a)]

5.2.1. Limits

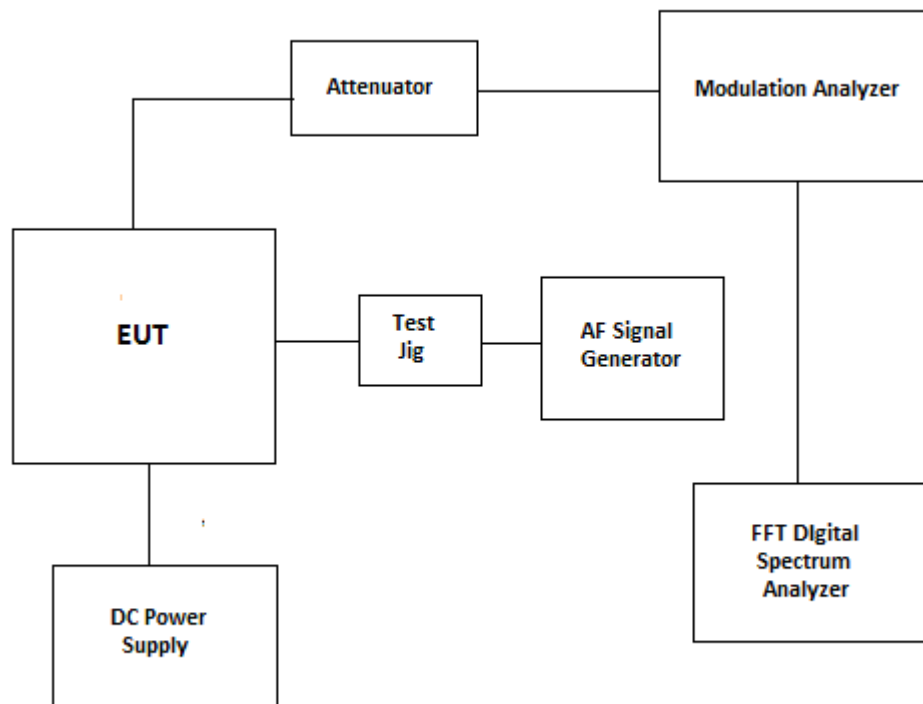
87.141

- (a) When A3E emission is used, the modulation percentage must not exceed 100 percent. This requirement does not apply to emergency locator transmitters or survival craft transmitters.
- (f) Each frequency modulated transmitter equipped with a modulation limiter must have a low pass filter between the modulation limiter and the modulated stage. At audio frequencies between 3 kHz and 15 kHz, the filter must have an attenuation greater than the attenuation at 1 kHz by at least $40 \log_{10} (f/3)$ db where “f” is the frequency in kilohertz. Above 15 kHz, the attenuation must be at least 28 db greater than the attenuation at 1 kHz.

5.2.2. Method of Measurements

The rated audio input signal was applied to the input of the audio lowpass filter (or of all modulation stages) using an audio oscillator, this input signal level and its corresponding output signal were then measured and recorded using the FFT (Audio) spectrum analyzer. Tests were repeated at different audio signal frequencies from 0 to 50 kHz.

5.2.3. Test Arrangement



5.2.4. Test Data

Remark: Due to the difficulty of measuring the Frequency Response of the internal low-pass filter, the frequency response of all modulation states was performed to show the roll-off at 3 kHz in comparison with FCC Limit for audio low-pass filter.

5.2.4.1. Audio Frequency Response of All Modulation States for 8.33 kHz Channel Spacing

Frequency (kHz)	Audio IN (dBV)	Audio OUT (dBV)	Attenuation (OUT - IN) (dB)	Attenuation wrt. 1 kHz (dB)	§87.141(f) Limit (dB)
0.1	-27.96	-24.83	3.1	-16.0	--
0.2	-27.96	-12.72	15.2	-3.9	--
0.4	-27.96	-9.60	18.4	-0.8	--
0.6	-27.96	-9.15	18.8	-0.3	--
0.8	-27.96	-8.96	19.0	-0.2	--
1.0	-27.96	-8.80	19.2	0.0	--
1.5	-27.96	-8.42	19.5	0.4	--
2.0	-27.96	-8.39	19.6	0.4	--
2.5	-27.96	-8.90	19.1	-0.1	--
3.0	-27.96	-9.60	18.4	-0.8	0
3.5	-27.96	-15.61	12.4	-6.8	-3
4.0	-27.96	-24.03	3.9	-15.2	-5
4.5	-27.96	-31.28	-3.3	-22.5	-7
5.0	-27.96	-37.46	-9.5	-28.7	-9
6.0	-27.96	-47.28	-19.3	-38.5	-12
7.0	-27.96	-55.24	-27.3	-46.4	-15
8.0	-27.96	-62.52	-34.6	-53.7	-17
9.0	-27.96	-68.72	-40.8	-59.9	-19
10.0	-27.96	-74.25	-46.3	-65.5	-21
12.0	-27.96	-83.74	-55.8	-74.9	-24
14.0	-27.96	-90.00	-62.0	-81.2	-27
16.0	-27.96	-90.00	-62.0	-81.2	-28
18.0	-27.96	-90.00	-62.0	-81.2	-28
20.0	-27.96	-90.00	-62.0	-81.2	-28
25.0	-27.96	-90.00	-62.0	-81.2	-28
30.0	-27.96	-90.00	-62.0	-81.2	-28
35.0	-27.96	-90.00	-62.0	-81.2	-28
40.0	-27.96	-90.00	-62.0	-81.2	-28
45.0	-27.96	-90.00	-62.0	-81.2	-28
50.0	-27.96	-90.00	-62.0	-81.2	-28

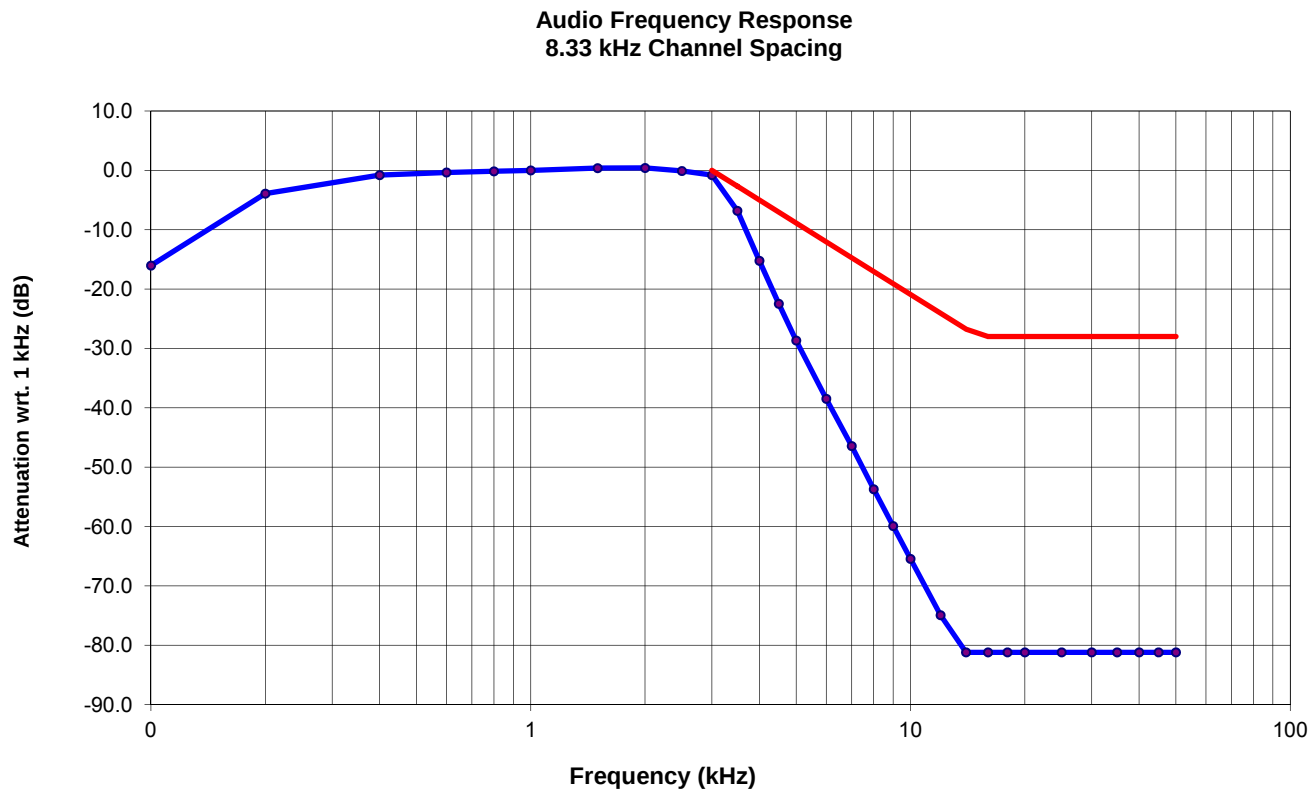
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5.2.4.2. Audio Frequency Response of All Modulation States for 25 kHz Channel Spacing

Frequency (kHz)	Audio IN (dBV)	Audio OUT (dBV)	Attenuation (OUT - IN) (dB)	Attenuation wrt. 1 kHz (dB)	§87.141(f) Limit (dB)
0.1	-28.02	-24.52	3.5	-15.7	--
0.2	-28.02	-12.86	15.2	-4.0	--
0.4	-28.02	-9.69	18.3	-0.8	--
0.6	-28.02	-9.21	18.8	-0.3	--
0.8	-28.02	-9.02	19.0	-0.1	--
1.0	-28.02	-8.87	19.2	0.0	--
1.5	-28.02	-8.49	19.5	0.4	--
2.0	-28.02	-8.48	19.5	0.4	--
2.5	-28.02	-8.97	19.1	-0.1	--
3.0	-28.02	-9.66	18.4	-0.8	0
3.5	-28.02	-15.66	12.4	-6.8	-3
4.0	-28.02	-24.09	3.9	-15.2	-5
4.5	-28.02	-31.35	-3.3	-22.5	-7
5.0	-28.02	-37.56	-9.5	-28.7	-9
6.0	-28.02	-47.35	-19.3	-38.5	-12
7.0	-28.02	-55.36	-27.3	-46.5	-15
8.0	-28.02	-62.42	-34.4	-53.6	-17
9.0	-28.02	-68.52	-40.5	-59.7	-19
10.0	-28.02	-74.37	-46.4	-65.5	-21
12.0	-28.02	-87.62	-59.6	-78.8	-24
14.0	-28.02	-90.00	-62.0	-81.1	-27
16.0	-28.02	-90.00	-62.0	-81.1	-28
18.0	-28.02	-90.00	-62.0	-81.1	-28
20.0	-28.02	-90.00	-62.0	-81.1	-28
25.0	-28.02	-90.00	-62.0	-81.1	-28
30.0	-28.02	-90.00	-62.0	-81.1	-28
35.0	-28.02	-90.00	-62.0	-81.1	-28
40.0	-28.02	-90.00	-62.0	-81.1	-28
45.0	-28.02	-90.00	-62.0	-81.1	-28
50.0	-28.02	-90.00	-62.0	-81.1	-28

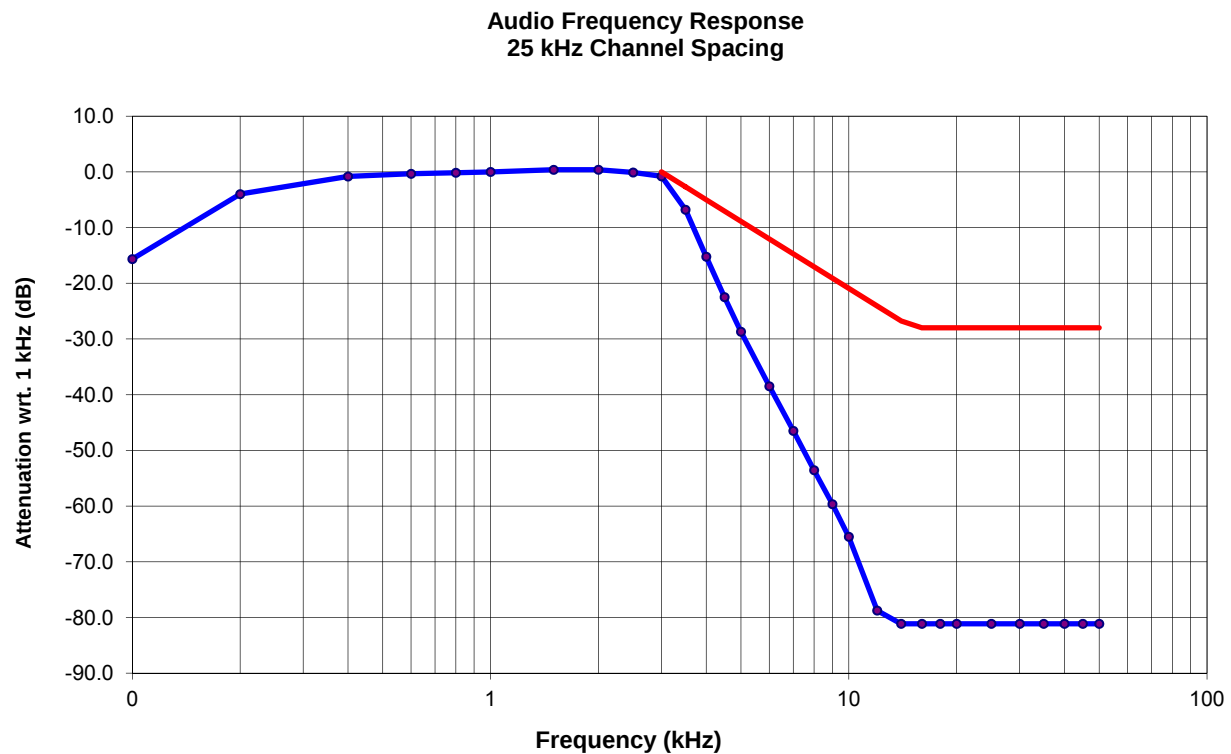
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5.3. MODULATION CHARACTERISTICS – MODULATION LIMITING [§§2.1047(a) & 87.141]

5.3.1. Limits

§87.141

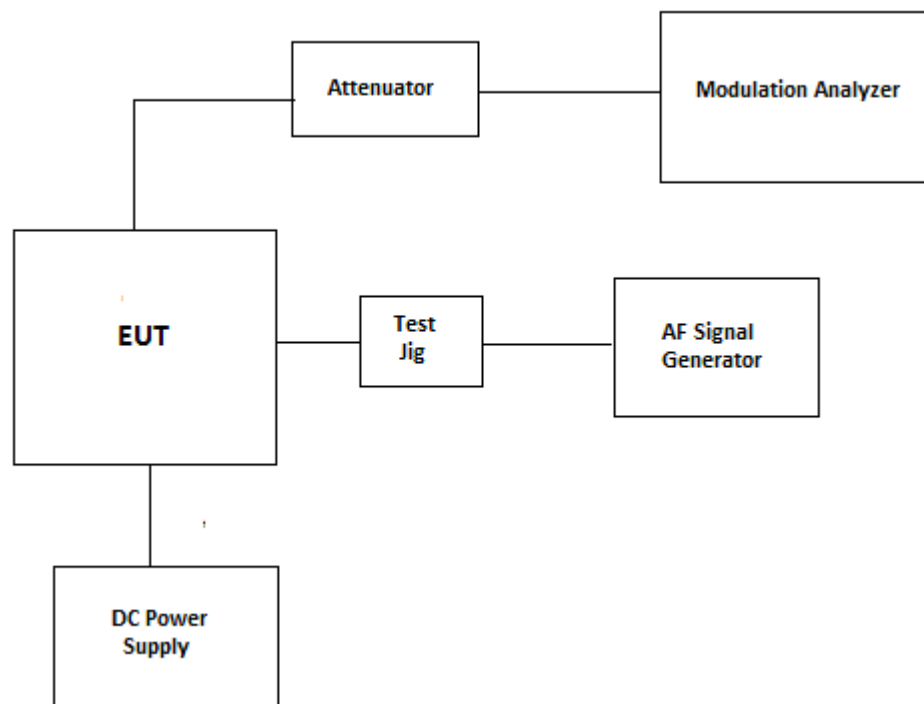
- (a) When A3E emission is used, the modulation percentage must not exceed 100 percent. This requirement does not apply to emergency locator transmitters or survival craft transmitters.
- (c) If any licensed radiotelephone transmitter causes harmful interference to any authorized radio service because of excessive modulation, the Commission will require the use of the transmitter to be discontinued until it is rendered capable of automatically preventing modulation in excess of 100 percent.

5.3.2. Method of Measurements

For Audio Transmitter:- The carrier frequency deviation was measured with the tone input signal level varied from 0 Vp to audio input rating level plus 16 dB at frequencies 0.1, 0.5, 1.0, 3.0 and 5.0 kHz. The maximum deviation was recorded at each test condition.

For Data Transmitter with Maximum Frequency Deviation set by Factory: The EUT was set at maximum frequency deviation, and its peak frequency deviation was then measured using EUT's internal random data source.

5.3.3. Test Arrangement



5.3.4. Test Data

5.3.4.1. Modulation Limiting at 8.33 kHz Channel Spacing

Modulating Signal Level (mVrms)	Peak Modulation Deviation (%)					Maximum Limit (%)
	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	
1	0.60	1.55	1.53	1.46	0.44	100
2	0.89	2.78	2.86	2.72	0.52	100
4	1.42	5.22	5.38	5.04	0.58	100
6	1.87	7.59	7.91	7.31	0.72	100
8	2.60	10.17	10.69	9.80	0.80	100
10	2.94	12.29	2.95	11.79	0.86	100
15	4.26	18.28	19.17	17.49	1.10	100
20	5.60	24.59	25.89	23.59	1.37	100
25	6.99	30.56	32.15	29.27	1.57	100
30	8.24	36.50	38.46	34.95	1.84	100
35	9.65	42.40	44.60	40.70	1.98	100
40	11.04	48.30	50.80	46.30	2.24	100
45	12.23	54.30	57.20	52.10	2.48	100
50	13.55	60.20	63.30	57.80	2.64	100
55	14.88	66.70	70.00	64.10	2.95	100
60	16.20	72.60	76.30	70.00	3.20	100
65	17.69	78.50	82.70	75.90	3.45	100
70	18.78	84.40	87.80	79.10	3.54	100
75	20.15	87.80	88.00	79.30	3.56	100
80	21.93	88.20	87.70	79.30	3.59	100
85	22.97	88.50	87.90	79.20	3.62	100
90	23.72	88.90	88.00	79.30	3.66	100
100	26.74	89.80	88.30	79.40	3.66	100
150	40.00	91.70	89.00	79.40	3.67	100
200	44.80	92.20	89.20	79.40	3.53	100
250	46.80	92.50	89.20	79.40	3.53	100
300	48.20	92.50	89.30	79.40	3.53	100
350	49.30	92.50	89.30	79.40	3.53	100

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Remarks

Standard Modulation Level: 40.00 mV = 32.04 dB (mVrms)
Voice Signal Input Level: Standard Modulation Level + 16 dB = 32.04 dB (mVrms) + 16 dB
= 48.04 dB (mVrms)
= 252.38 mVrms

Standard Modulation Level measured at 50% Modulation @ 1.0 kHz.

Modulation Frequency (kHz)	Peak Depth (%)	Maximum Limit (%)
0.1	46.40	100.0
0.2	78.50	100.0
0.4	92.00	100.0
0.6	92.00	100.0
0.8	90.00	100.0
1.0	89.00	100.0
1.2	87.50	100.0
1.4	86.30	100.0
1.6	85.20	100.0
1.8	84.80	100.0
2.0	83.60	100.0
2.5	80.40	100.0
3.0	79.20	100.0
3.5	41.00	100.0
4.0	15.39	100.0
4.5	6.85	100.0
5.0	3.53	100.0
6.0	1.30	100.0
7.0	0.66	100.0
8.0	0.48	100.0
9.0	0.36	100.0
10.0	0.29	100.0

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5.3.4.2. Modulation Limiting at 25 kHz Channel Spacing

Modulating Signal Level	Peak Modulation Deviation (%)					Maximum Limit (%)
(mVrms)	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	(%)
1	0.73	1.77	1.78	1.65	0.53	100
2	0.95	2.85	3.03	2.87	0.64	100
4	1.43	5.30	5.60	5.15	0.69	100
6	1.93	7.71	8.15	7.42	0.73	100
8	2.47	10.21	10.86	9.89	0.97	100
10	2.98	12.40	13.15	11.97	0.97	100
15	4.18	18.27	19.34	17.67	1.19	100
20	5.54	24.74	26.10	23.85	1.48	100
25	6.96	30.54	32.42	29.57	1.73	100
30	8.02	36.58	38.62	35.29	1.92	100
35	9.28	742.50	44.90	41.00	2.16	100
40	10.54	48.40	51.20	46.80	2.43	100
45	11.86	54.30	57.40	52.60	2.64	100
50	13.23	60.30	63.60	58.30	2.89	100
55	14.32	66.60	70.30	64.60	3.12	100
60	15.78	72.60	76.60	70.40	3.39	100
65	17.02	78.60	82.90	76.60	3.65	100
70	18.34	84.50	87.70	79.00	3.78	100
75	19.36	87.80	87.90	79.20	3.77	100
80	21.25	88.10	87.70	79.20	3.77	100
85	22.05	88.50	87.80	79.20	3.83	100
90	23.15	88.70	88.00	79.20	3.86	100
100	25.87	89.70	88.20	79.40	3.93	100
150	38.59	91.40	88.80	79.40	3.91	100
200	43.60	92.00	89.20	79.40	3.77	100
250	45.40	92.20	89.20	79.40	3.77	100
300	46.70	92.30	89.20	79.40	3.76	100
350	47.70	92.30	89.20	79.40	3.76	100

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Remarks

Standard Modulation Level: 39.70 mV = 31.98 dB (mVrms)
Voice Signal Input Level: Standard Modulation Level + 16 dB = 31.98 dB (mVrms) + 16 dB
= 47.98 dB (mVrms)
= 250.49 mVrms

Standard Modulation Level measured at 50% Modulation @ 1.0 kHz.

Modulation Frequency (kHz)	Peak Depth (%)	Maximum Limit (%)
0.1	46.20	100.0
0.2	78.50	100.0
0.4	92.10	100.0
0.6	92.00	100.0
0.8	90.10	100.0
1.0	89.10	100.0
1.2	87.50	100.0
1.4	86.40	100.0
1.6	85.30	100.0
1.8	84.80	100.0
2.0	83.70	100.0
2.5	80.50	100.0
3.0	79.20	100.0
3.5	40.90	100.0
4.0	15.36	100.0
4.5	6.87	100.0
5.0	3.64	100.0
6.0	1.45	100.0
7.0	0.83	100.0
8.0	0.58	100.0
9.0	0.53	100.0
10.0	0.44	100.0

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5.4. OCCUPIED BANDWIDTH AND EMISSION MASKS [§§ 2.1049, 87.135 & 87.139]

5.4.1. Limits

§ 87.139

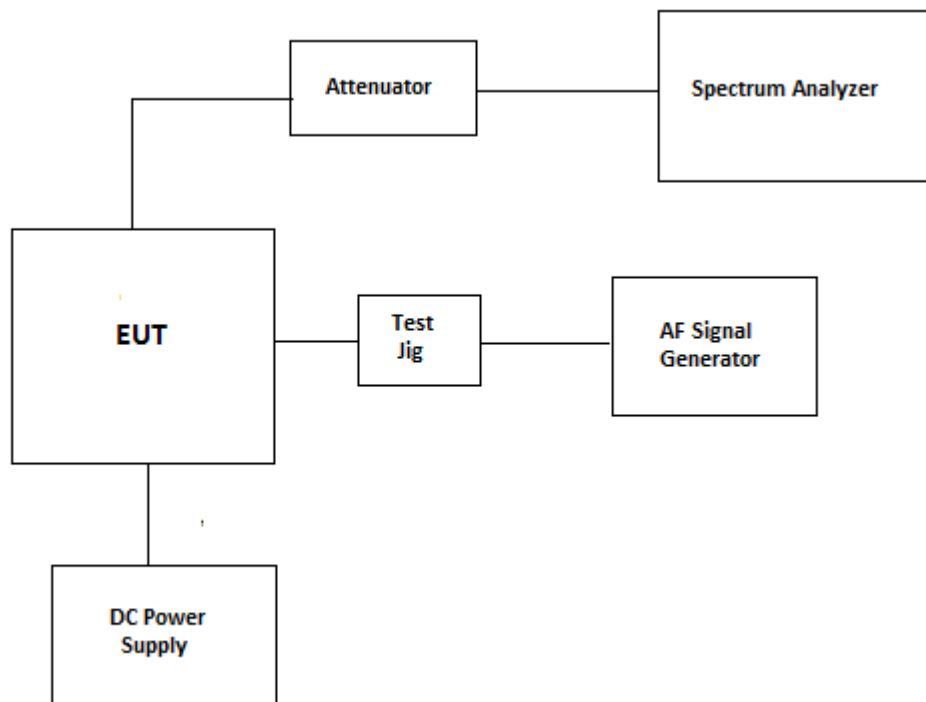
(a) Except for ELTs and when using single sideband (R3E, H3E, J3E), or frequency modulation (F9) or digital modulation (F9Y) for telemetry or telecommand in the frequency bands 1435–1535 MHz and 2310–2390 MHz or digital modulation (G7D) for differential GPS, the mean power of any emission must be attenuated below the mean power of the transmitter (pY) as follows:

- (1) When the frequency is removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth the attenuation must be at least 25 dB;
- (2) When the frequency is removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth the attenuation must be at least 35 dB.
- (3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} pY$ dB.

5.4.2. Method of Measurements

47 CFR 2.1049 and ANSI C63.26 Sections 5.4 and 5.7.

5.4.3. Test Arrangement



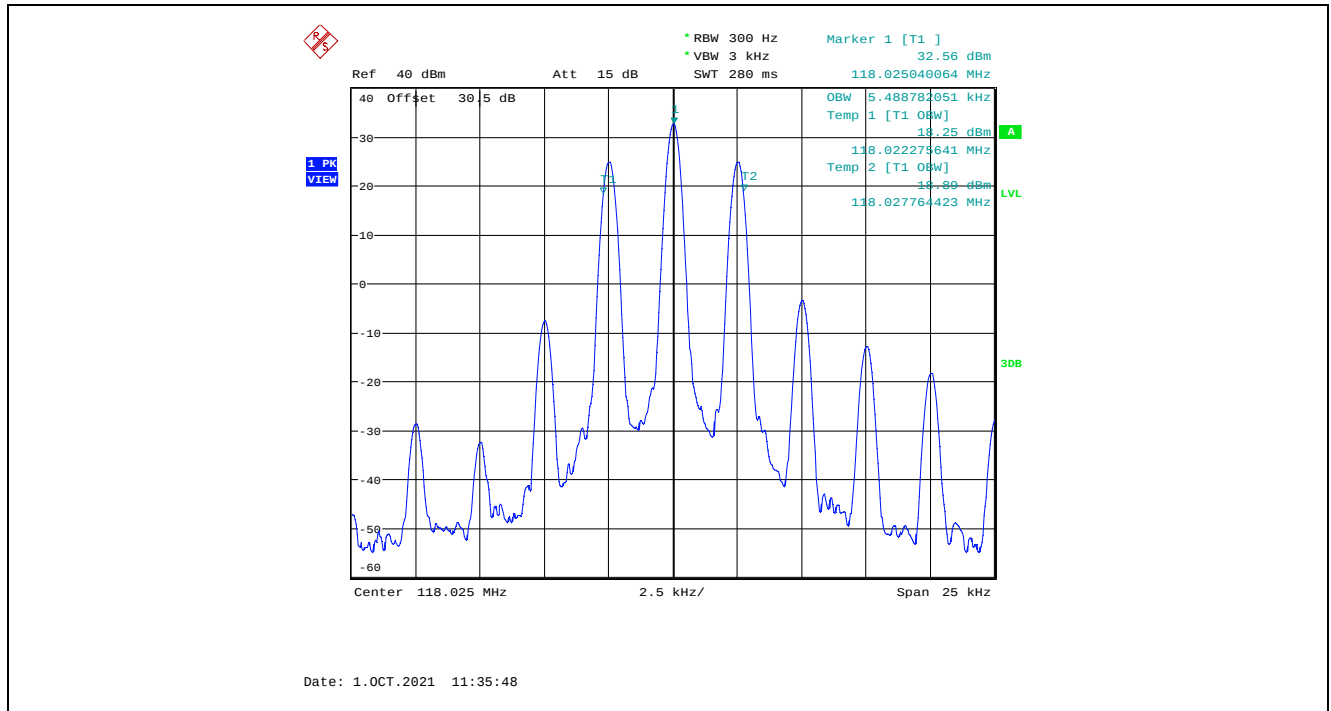
5.4.4. Test Data

5.4.4.1. 99% Occupied Bandwidth

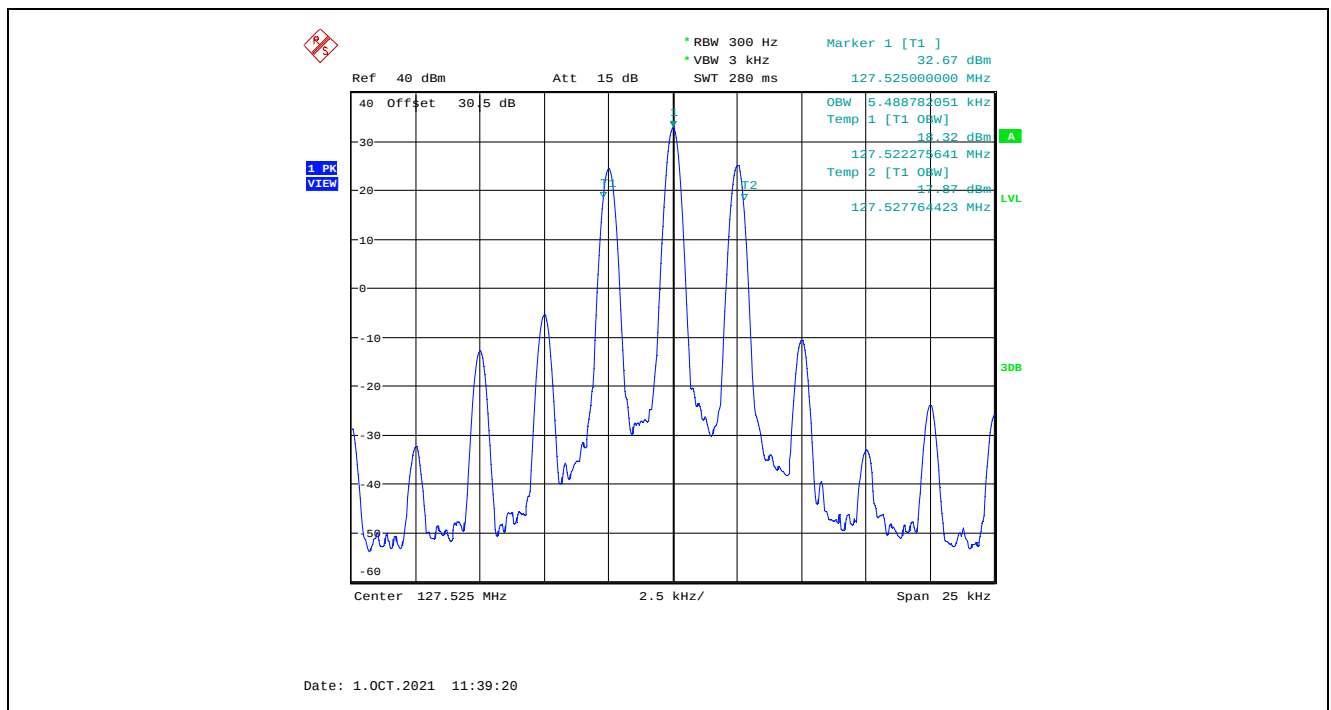
Channel Spacing (kHz)	Frequency (MHz)	*Measured 99% OBW (kHz)	Authorized Bandwidth (kHz)
8.33	118.030	5.489	8.33
	127.530	5.489	8.33
	136.980	5.489	8.33
25	118.025	5.489	25
	127.525	5.489	25
	136.975	5.489	25

* See the following plots for details of measurements

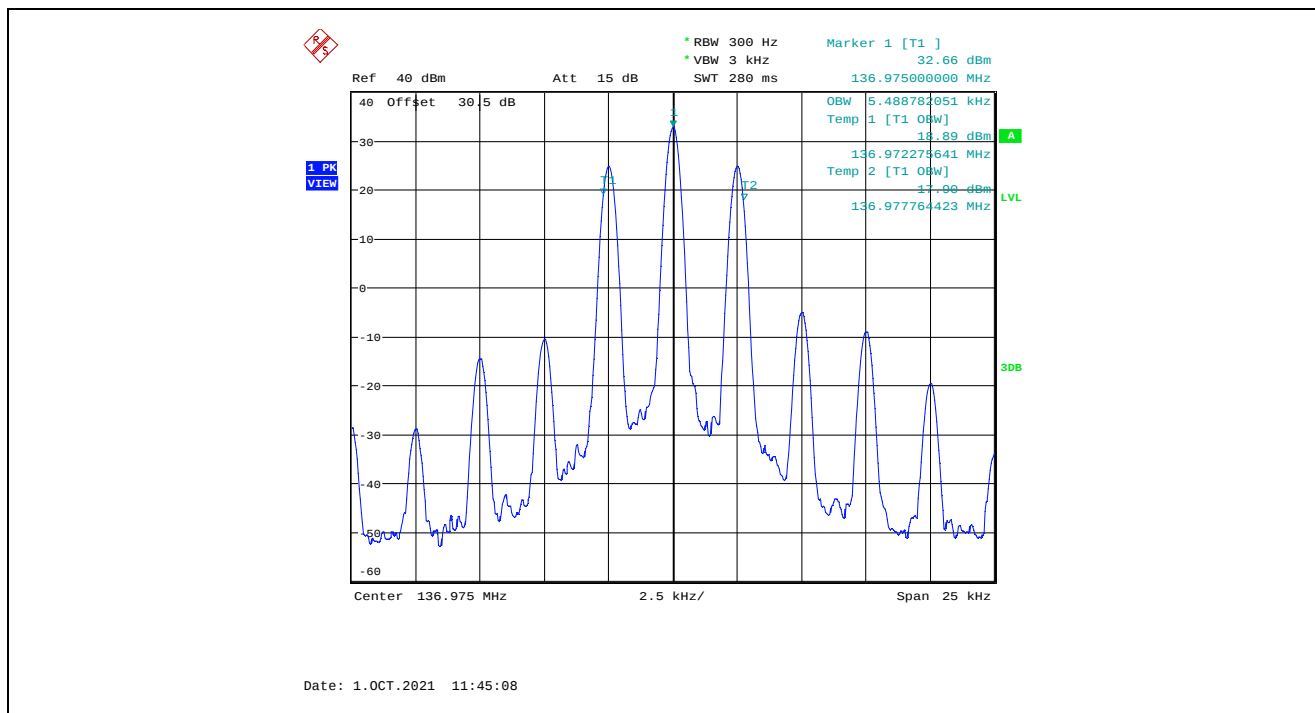
Plot 5.4.4.1.1. 99% Occupied Bandwidth, 8.33 kHz Channel Spacing, 118.030 MHz



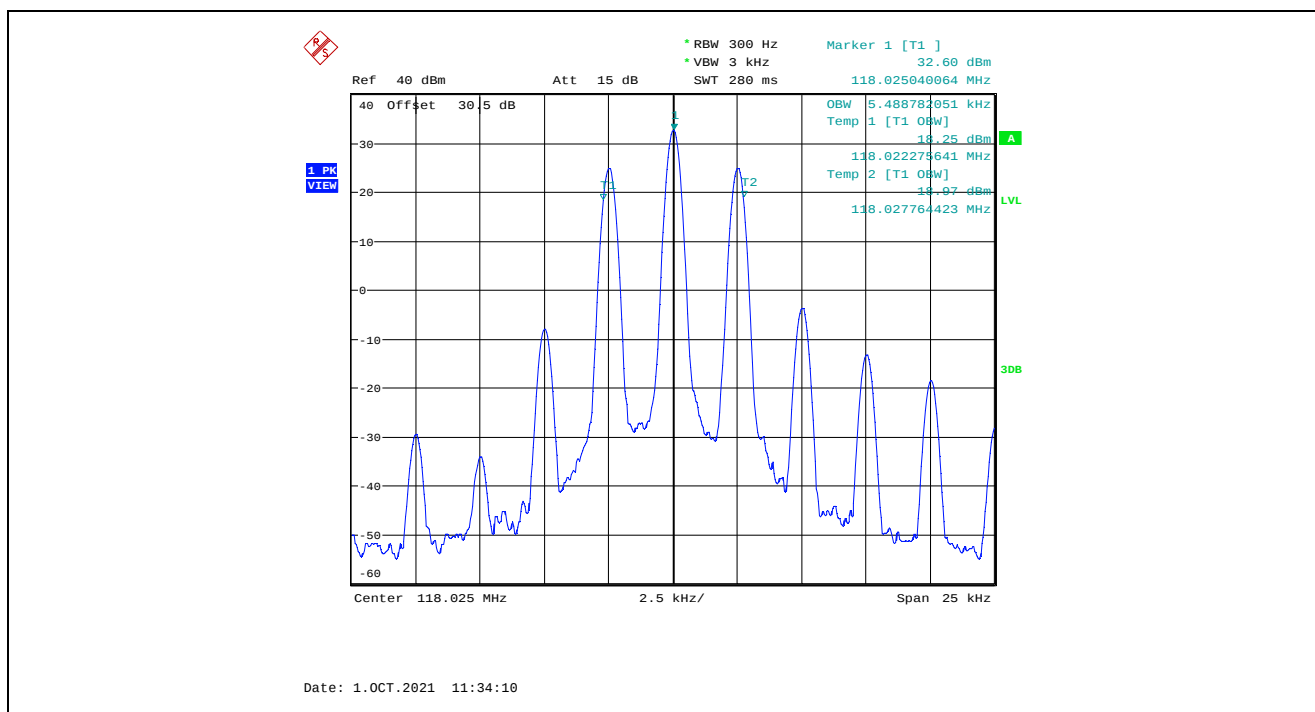
Plot 5.4.4.1.2. 99% Occupied Bandwidth, 8.33 kHz Channel Spacing, 127.530 MHz



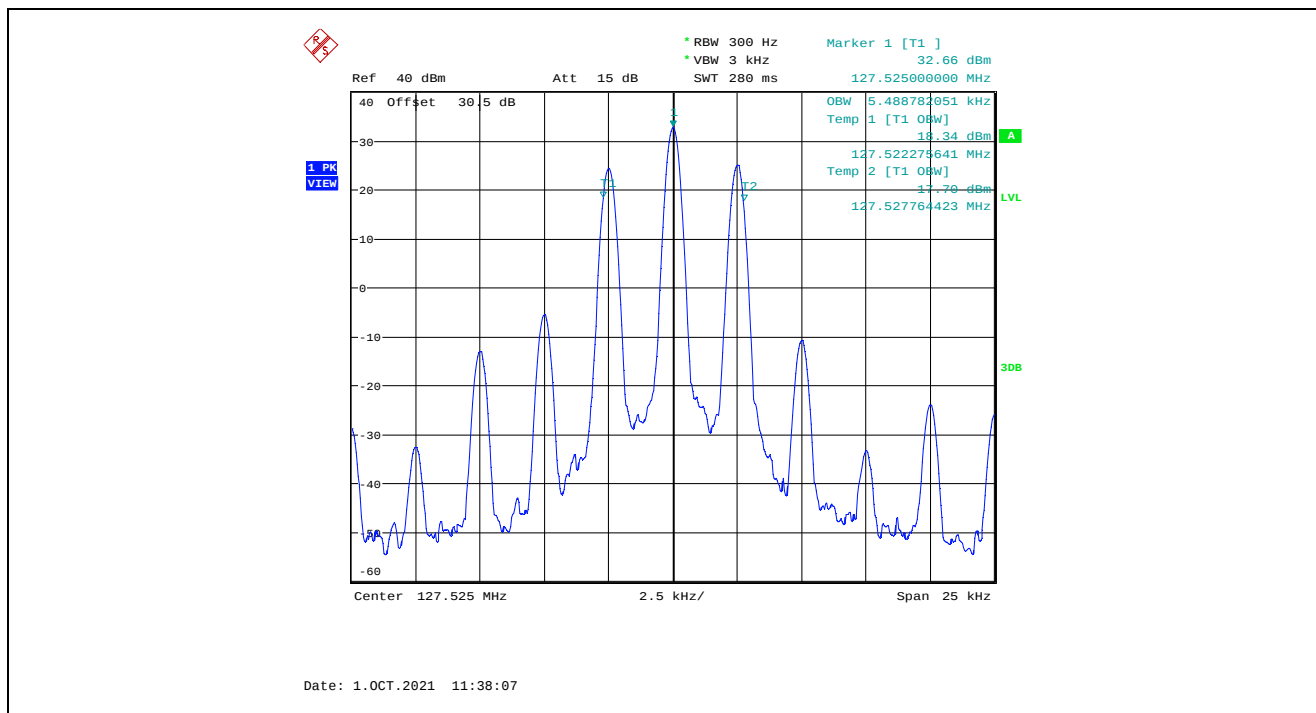
Plot 5.4.4.1.3. 99% Occupied Bandwidth, 8.33 kHz Channel Spacing, 136.980 MHz



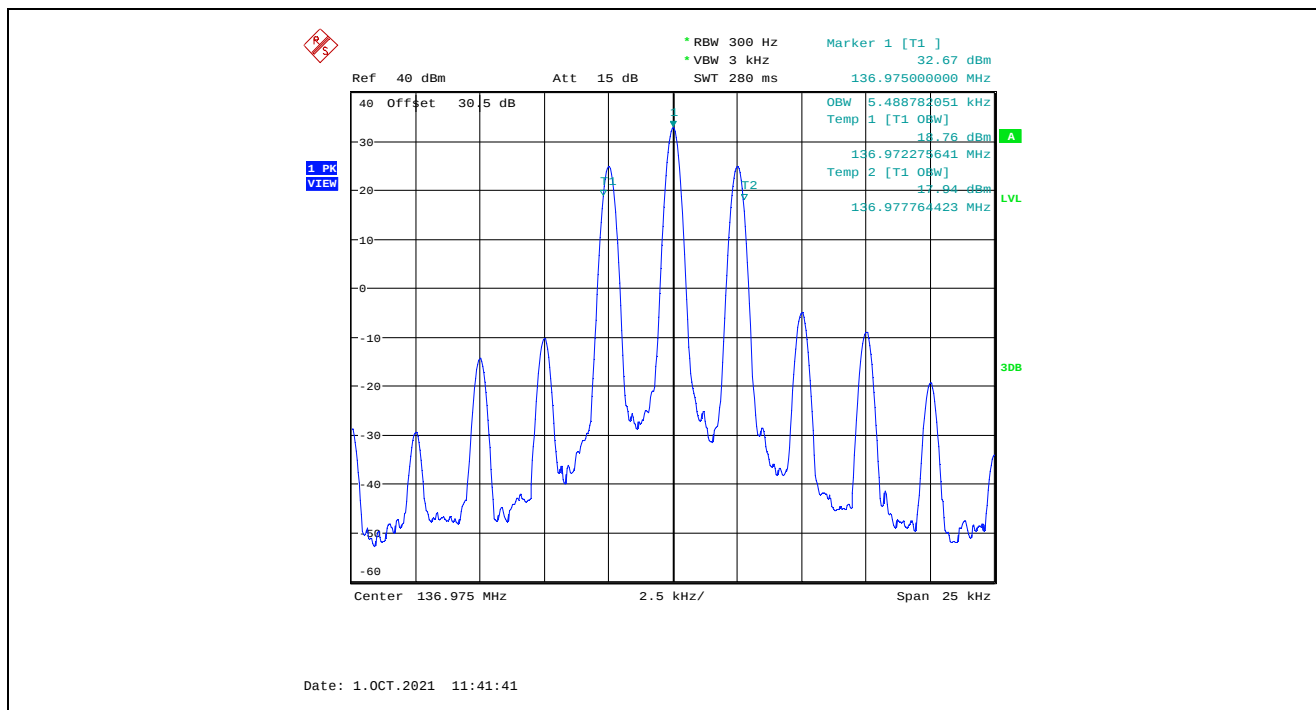
Plot 5.4.4.1.4. 99% Occupied Bandwidth, 25 kHz Channel Spacing, 118.025 MHz



Plot 5.4.4.1.5. 99% Occupied Bandwidth, 25 kHz Channel Spacing, 127.525 MHz

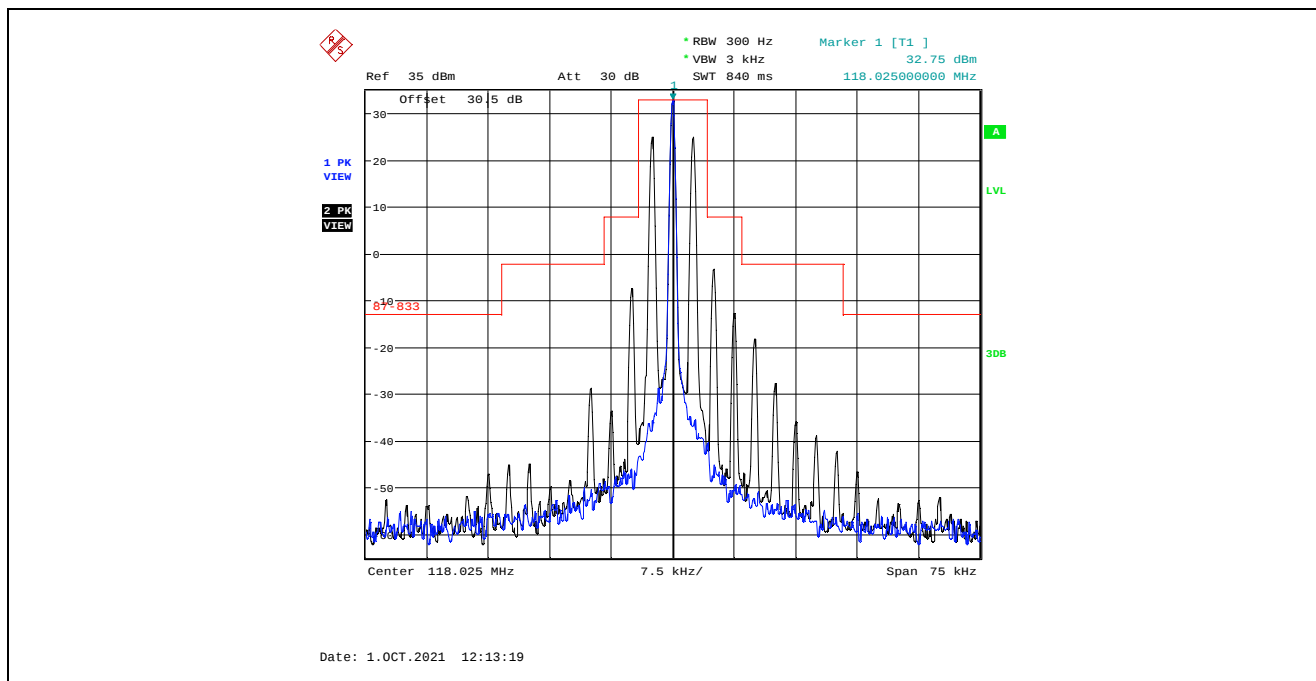


Plot 5.4.4.1.6. 99% Occupied Bandwidth, 25 kHz Channel Spacing, 136.975 MHz

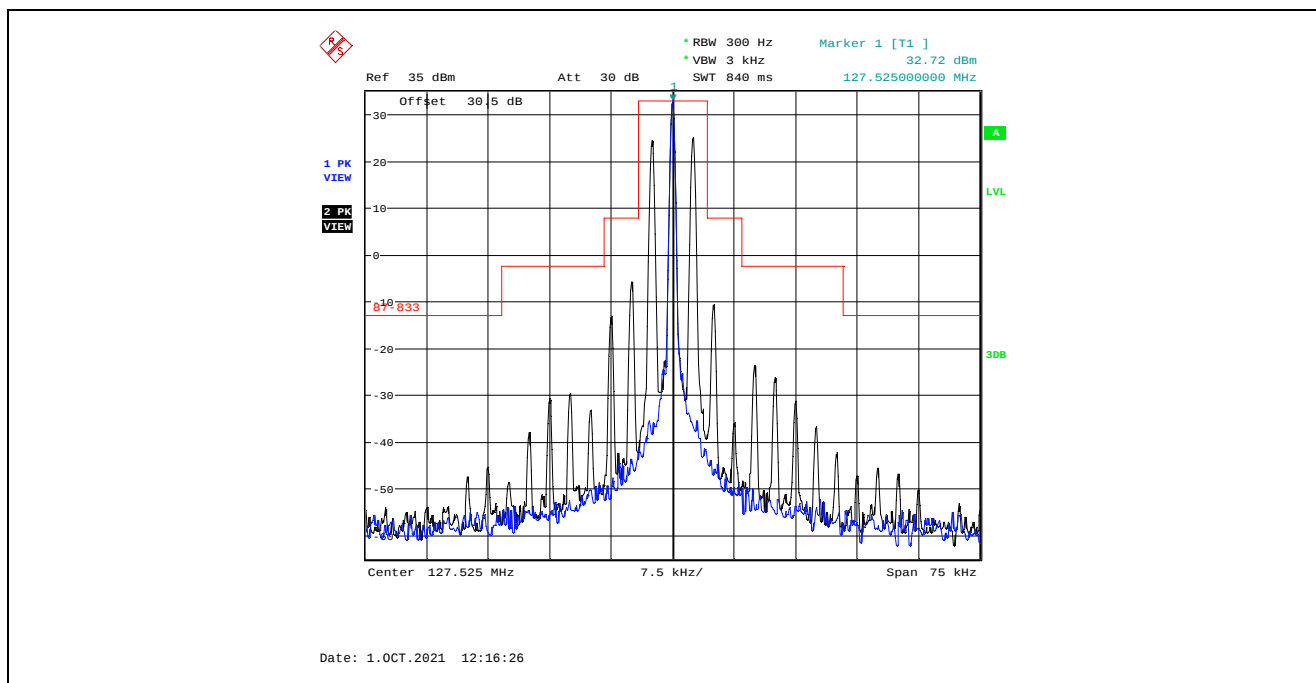


5.4.4.2. Emission Limitation

Plot 5.4.4.2.1. Emission Limitation, 8.33 kHz Channel Spacing, 118.030 MHz



Plot 5.4.4.2.2. Emission Limitation, 8.33 kHz Channel Spacing, 127.530 MHz



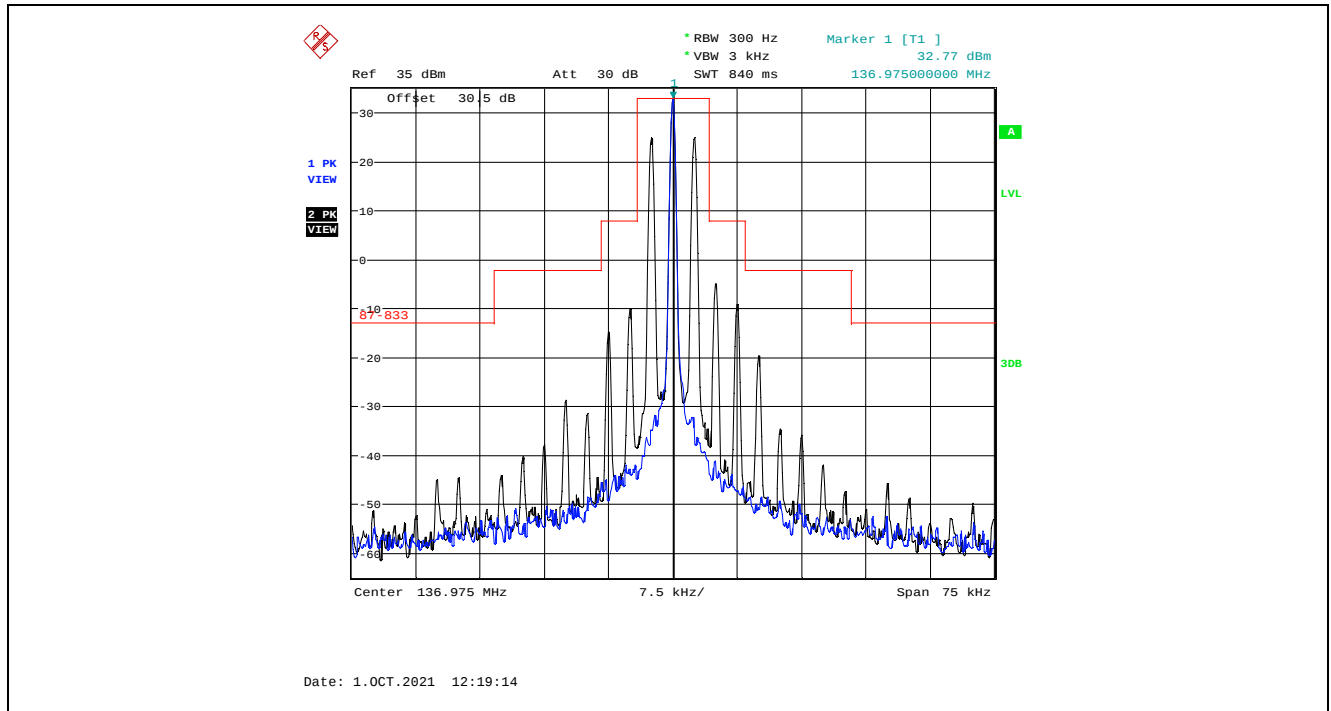
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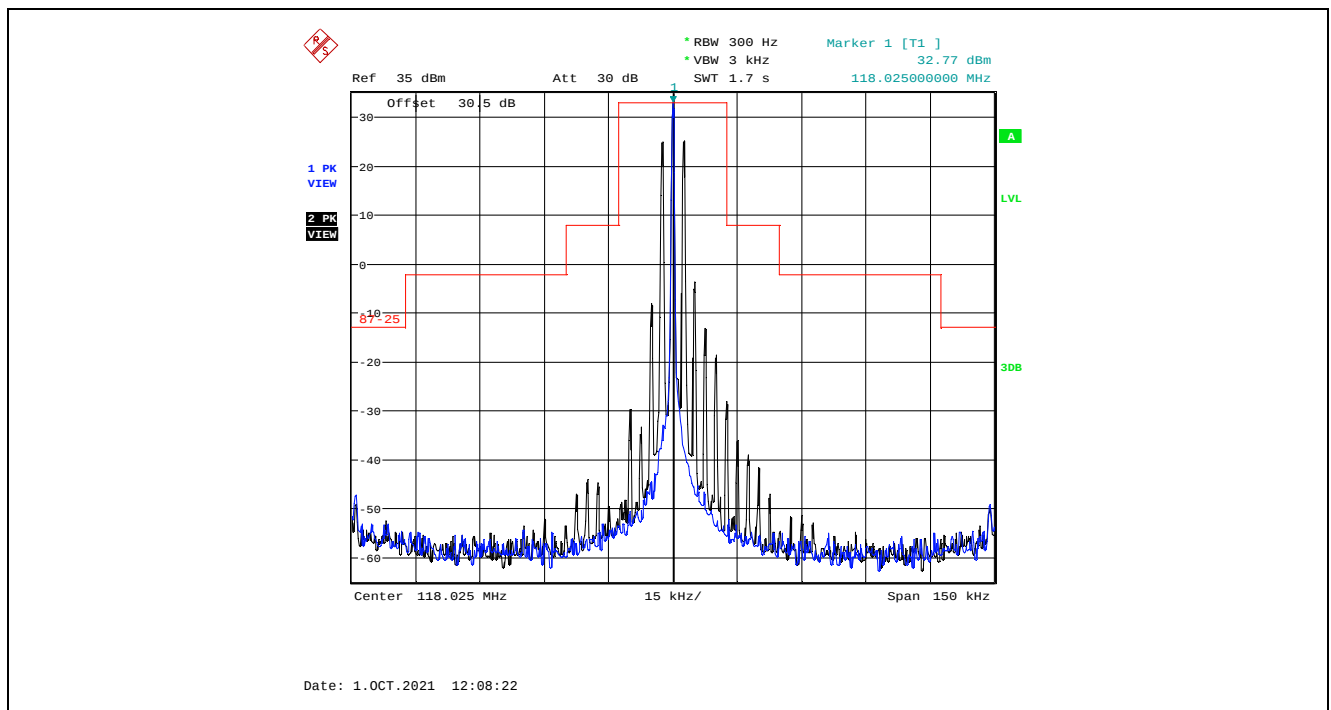
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Plot 5.4.4.2.3. Emission Limitation, 8.33 kHz Channel Spacing, 136.980 MHz



Plot 5.4.4.2.4. Emission Limitation, 25 kHz Channel Spacing, 118.025 MHz



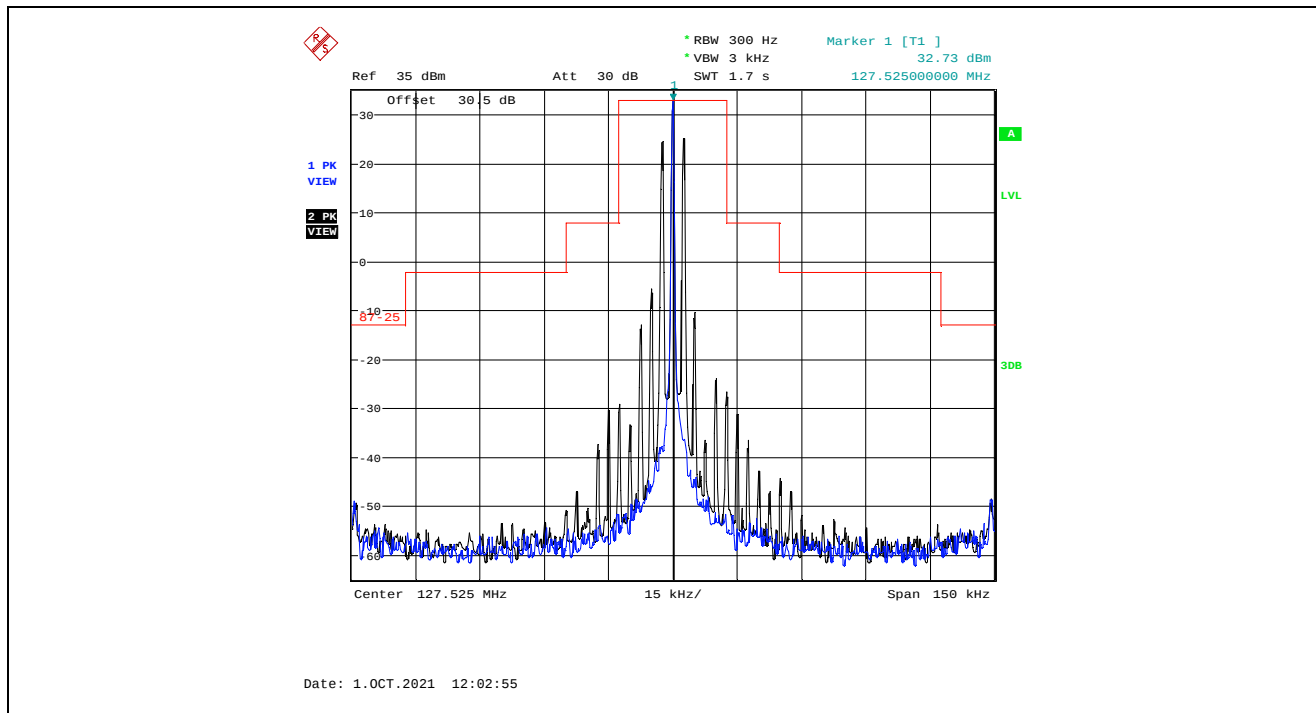
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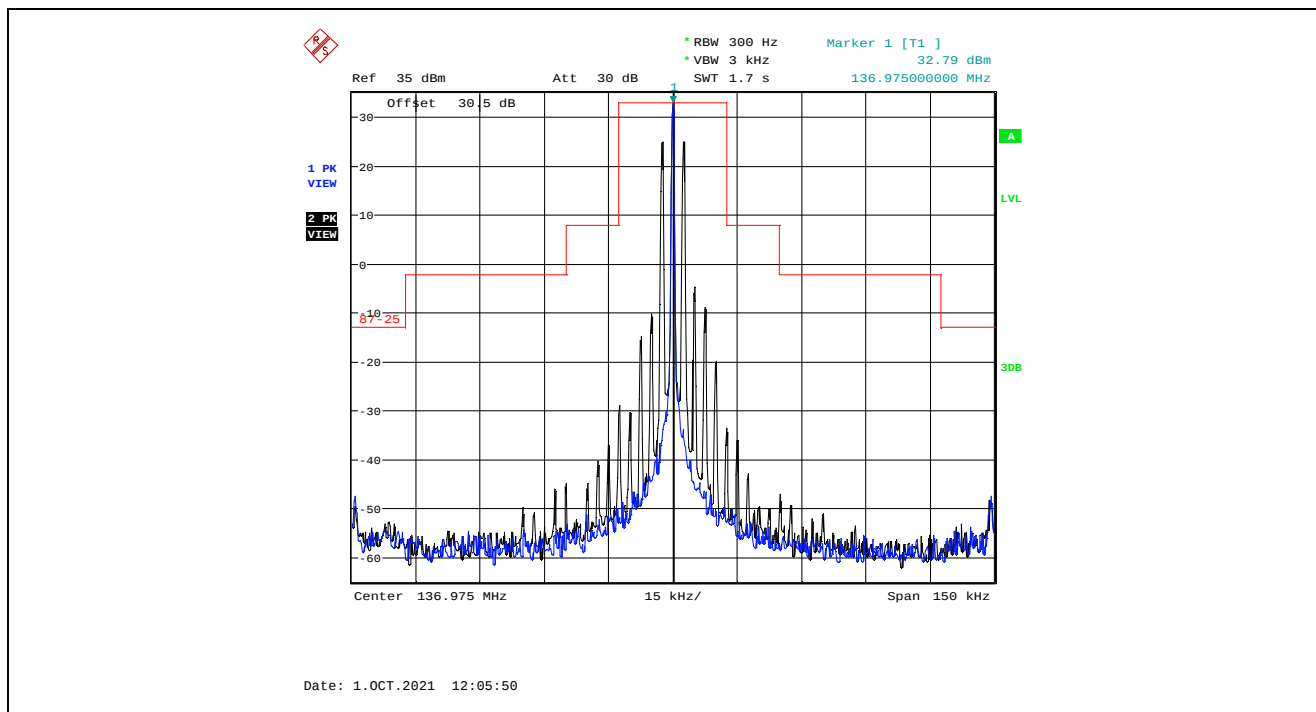
File #: 21ICOM551_FCC87
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Plot 5.4.4.2.5. Emission Limitation, 25 kHz Channel Spacing, 127.525 MHz



Plot 5.4.4.2.6. Emission Limitation, 25 kHz Channel Spacing, 136.975 MHz



5.5. TRANSMITTER SPURIOUS EMISSIONS AT ANTENNA TERMINALS [§§ 2.1053 & 87.139]

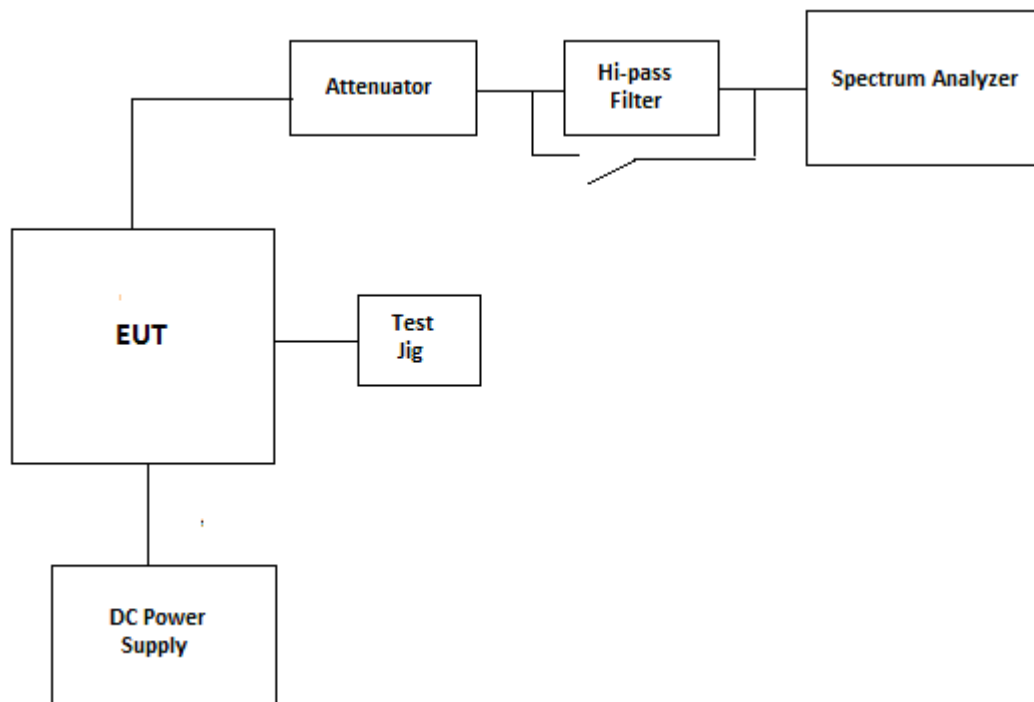
5.5.1. Limits

§ 87.139(a)(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} \text{pY dB}$.

5.5.2. Method of Measurements

ANSI C63.26 Section 5.7.

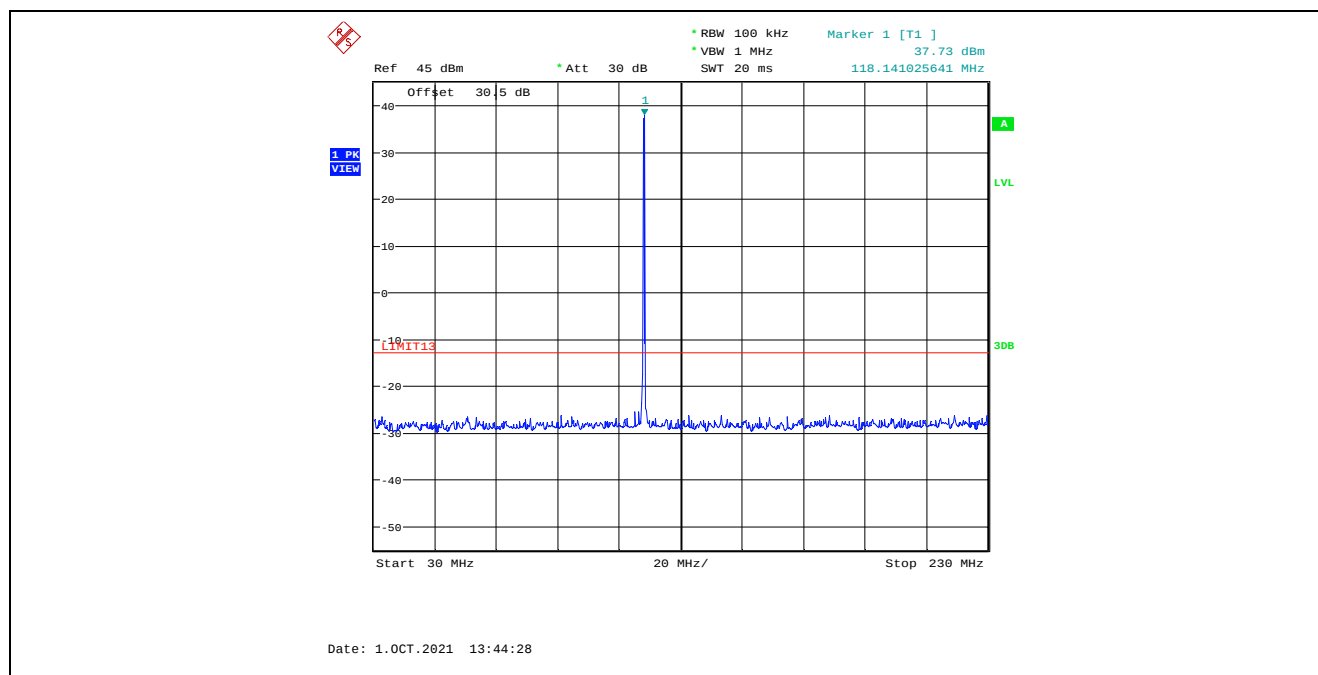
5.5.3. Test Arrangement



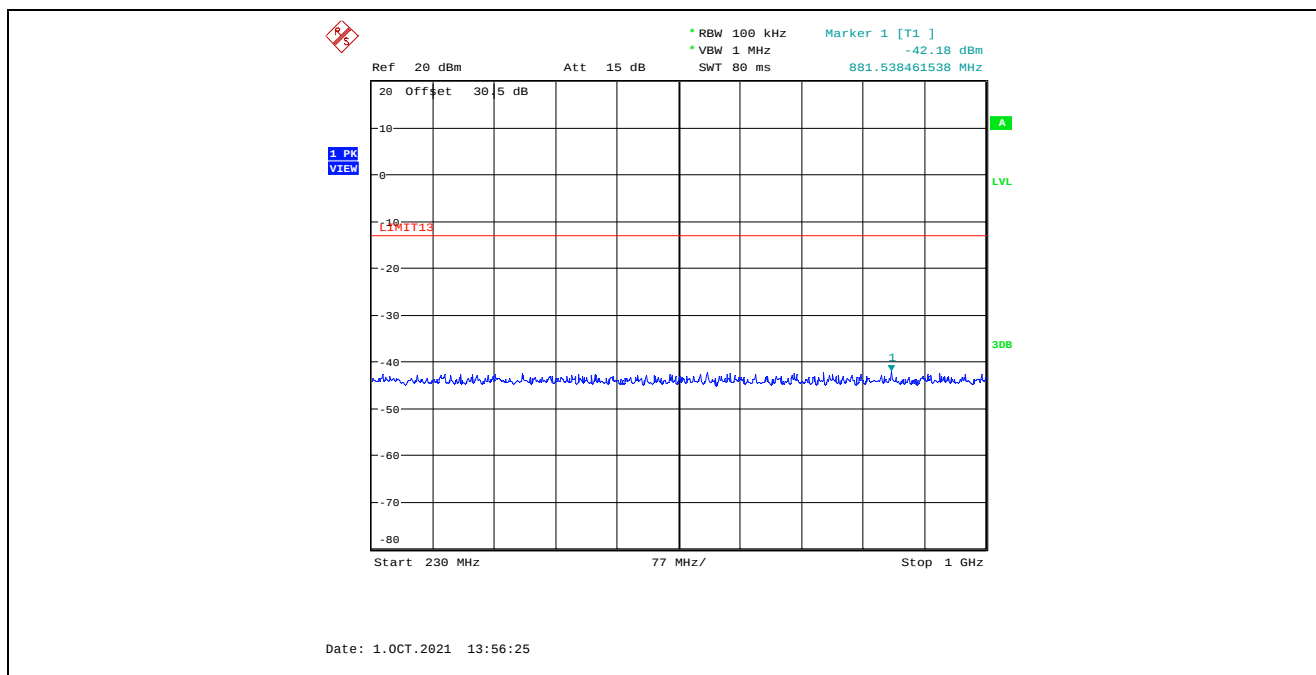
5.5.4. Test Data

Remark: There was no difference in spurious/harmonic emissions on the pre-scans for different channel spacing and input voltage levels. Therefore, the RF spurious/harmonic emissions in this section would be performed for 25 KHz channel spacing and limit of $43 + 10 \log_{10} \text{ pY dB}$ applied for worst case.

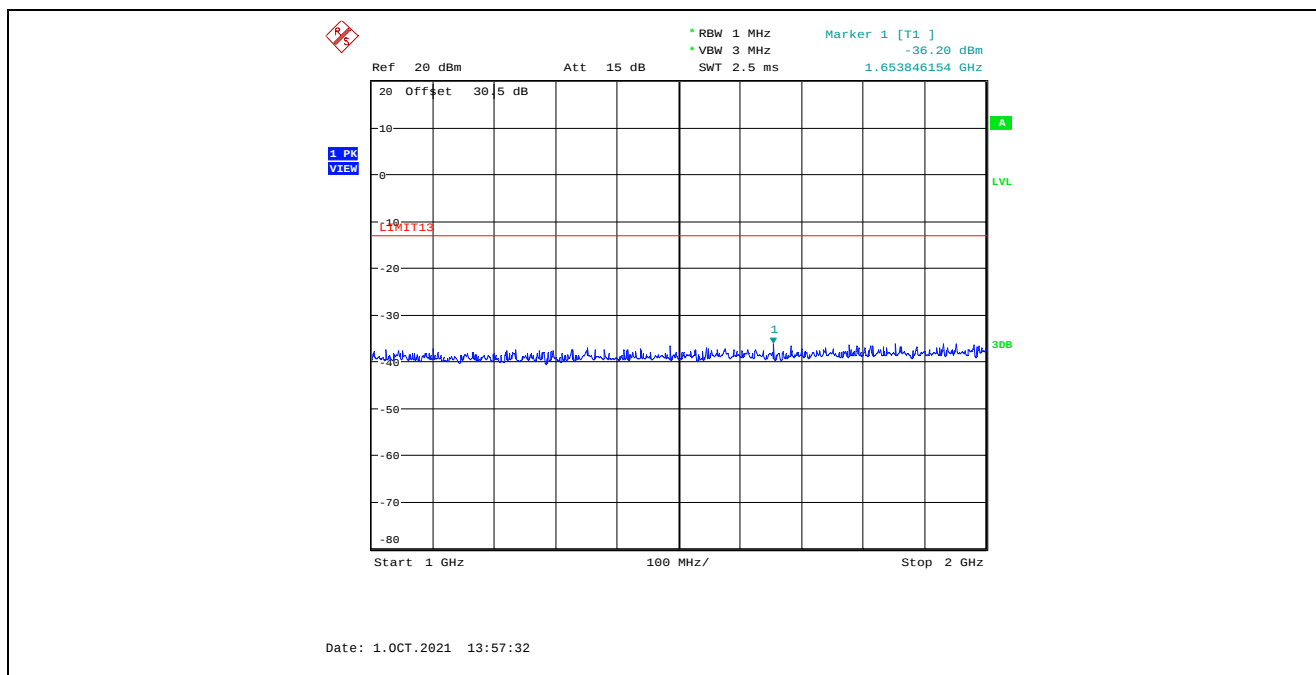
Plot 5.5.4.1. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 118.025 MHz
30 MHz – 230 MHz



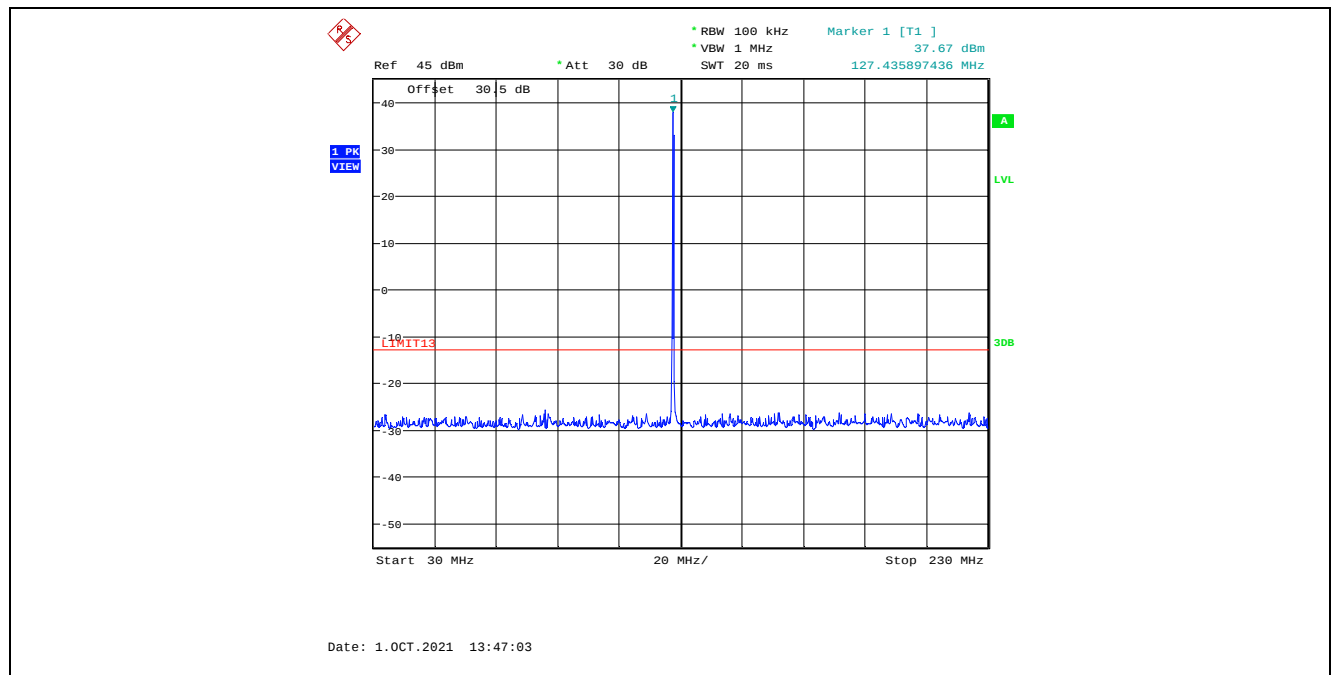
Plot 5.5.4.2. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 118.025 MHz
230 MHz – 1 GHz



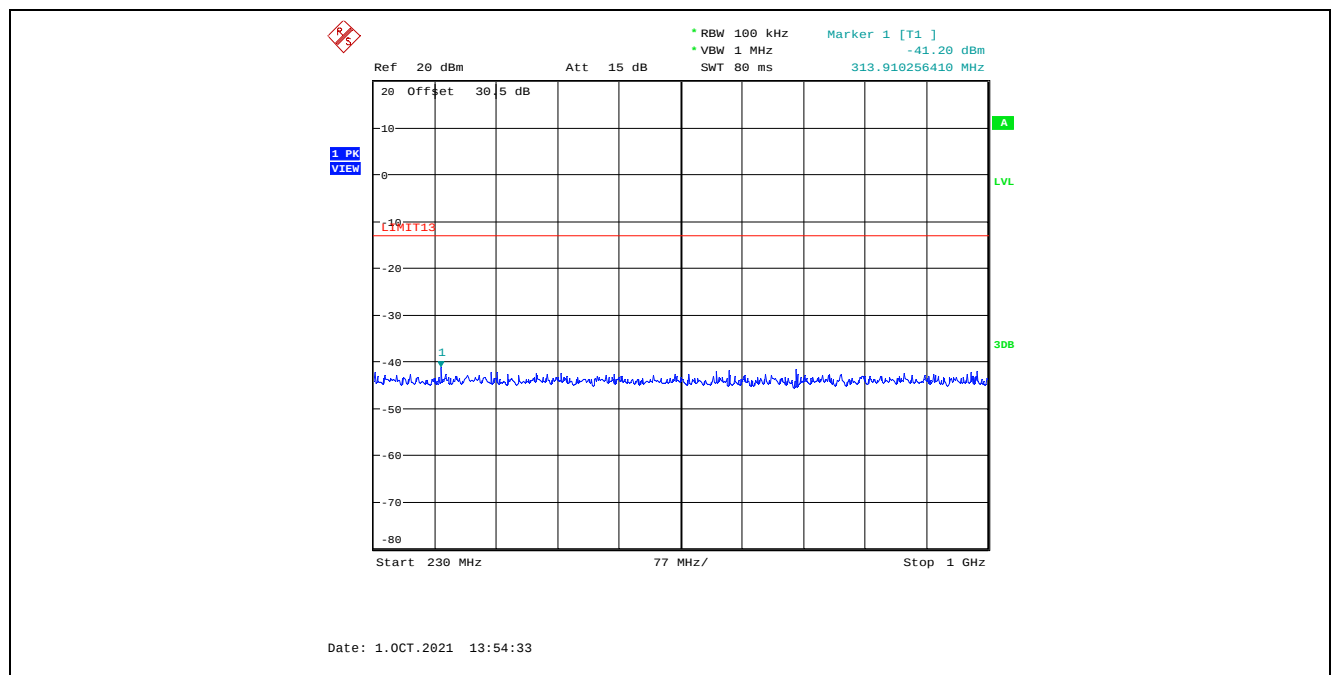
Plot 5.5.4.3. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 118.025 MHz
1 GHz – 2 GHz



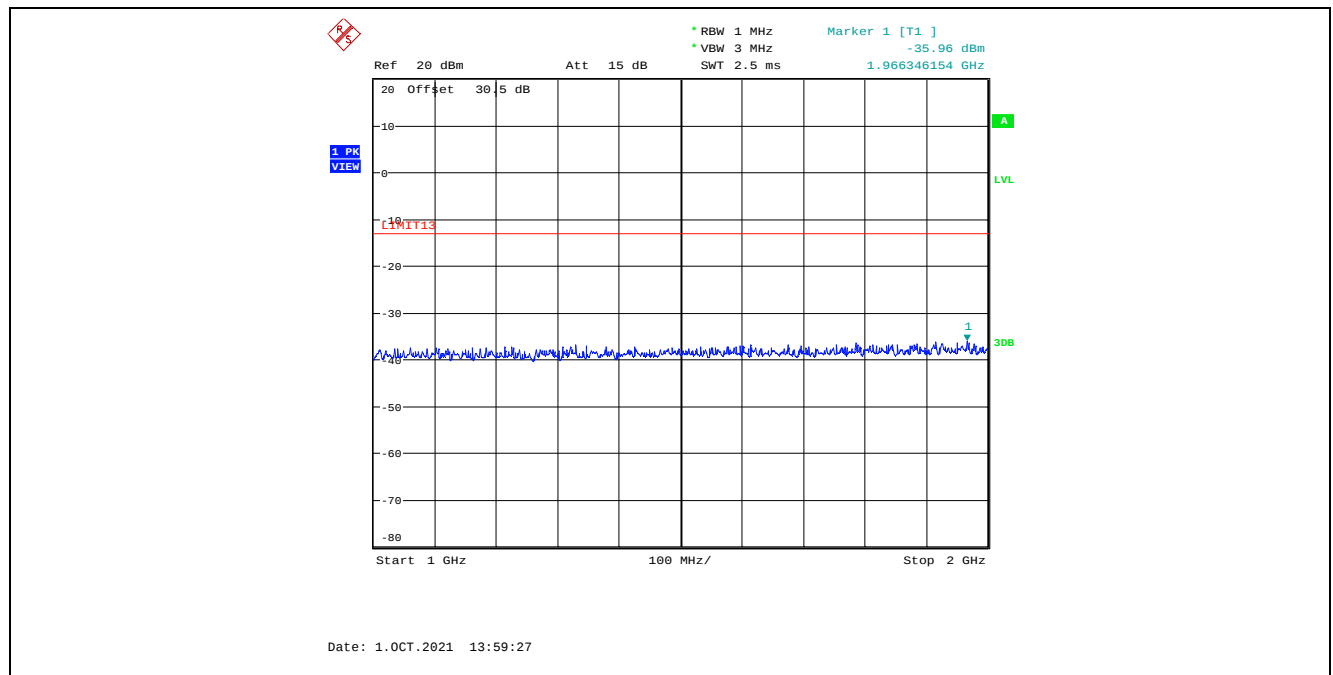
Plot 5.5.4.4. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 127.525 MHz
30 MHz – 230 MHz



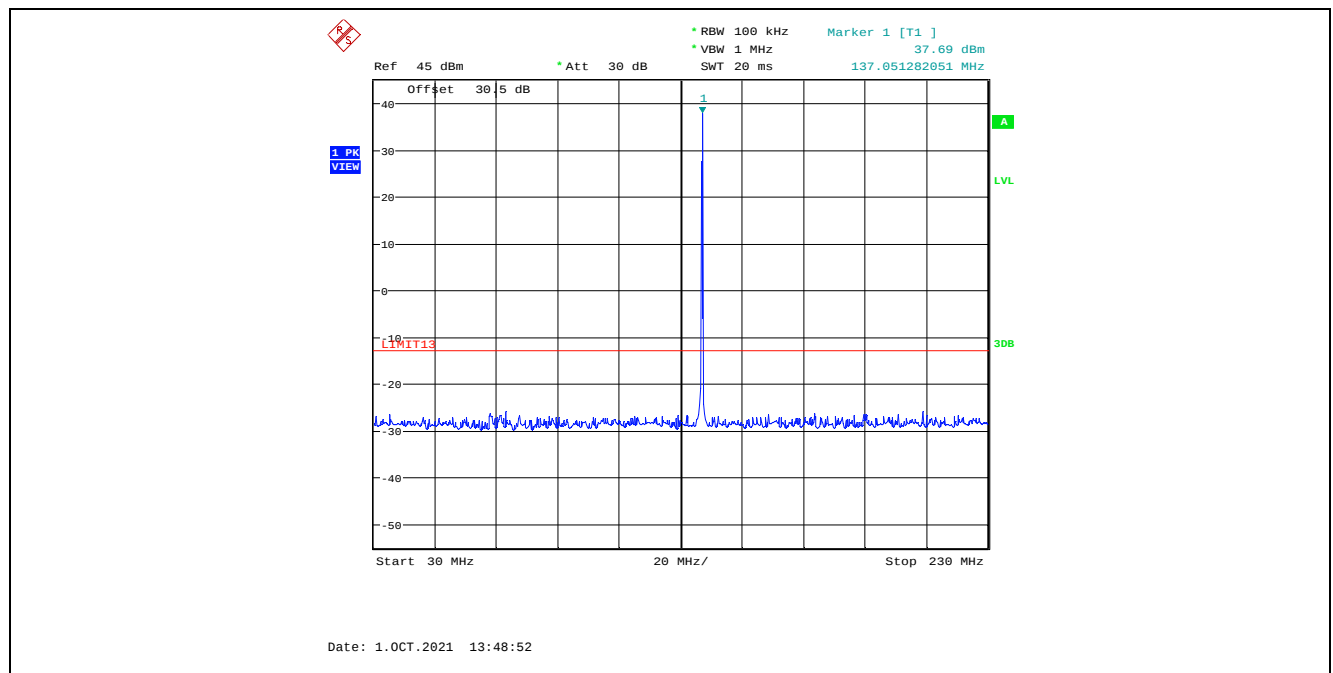
Plot 5.5.4.5. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 127.525 MHz
230 MHz – 1 GHz



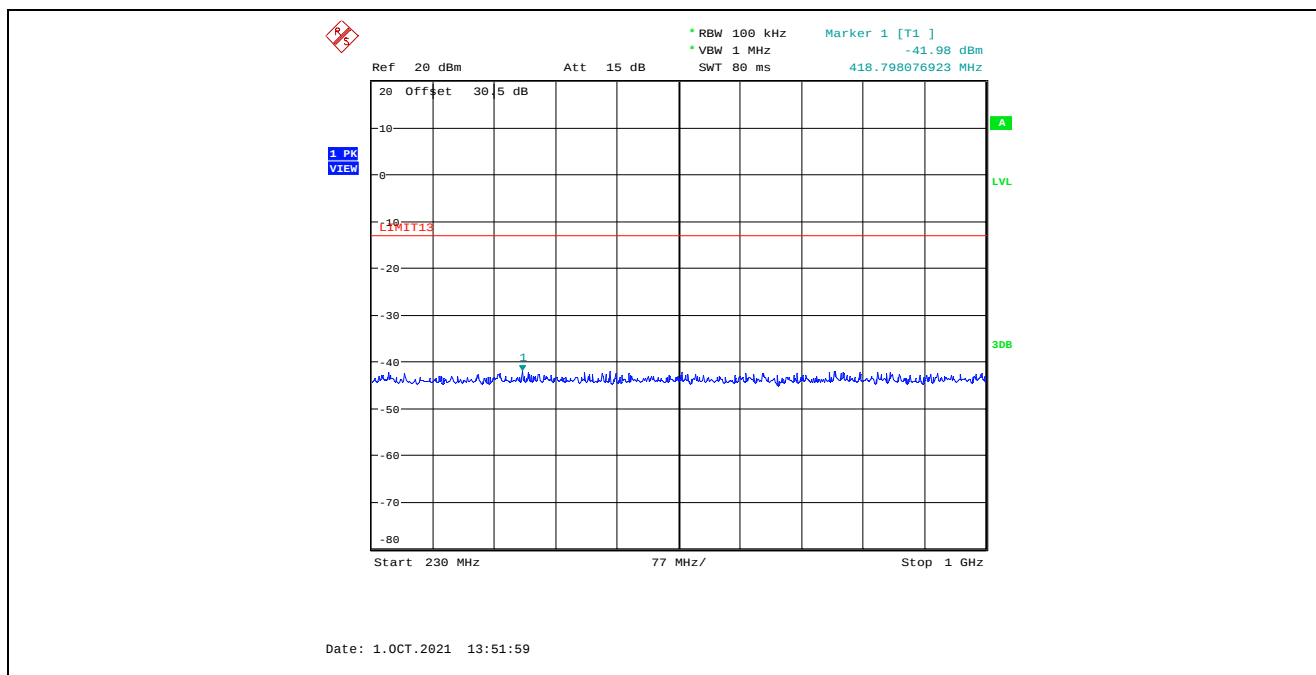
Plot 5.5.4.6. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 127.525 MHz
1 GHz – 2 GHz



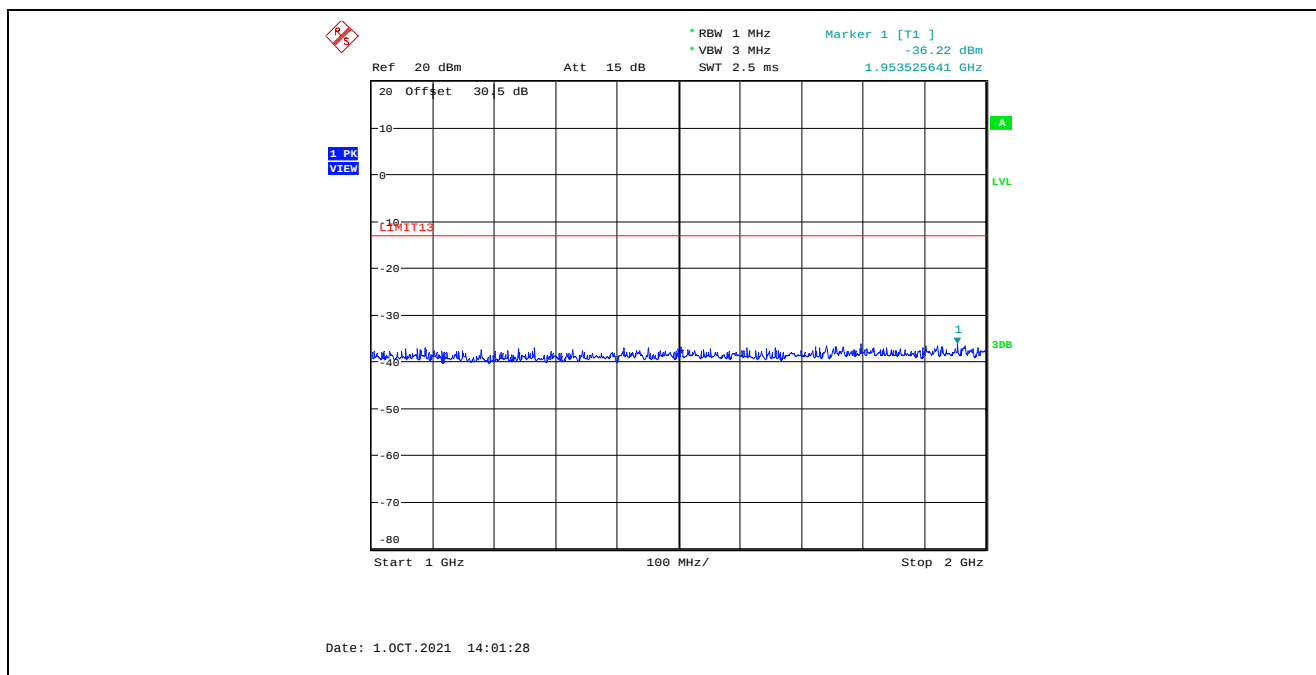
Plot 5.5.4.7. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 136.975 MHz
30 MHz – 230 MHz



Plot 5.5.4.8. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 136.975 MHz
230 MHz – 1 GHz



Plot 5.5.4.9. Transmitter Spurious Emissions at Antenna Terminal, 25 kHz Channel Spacing, 136.975 MHz
1 GHz – 2 GHz



5.6. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS [§§ 2.1053 & 87.139]

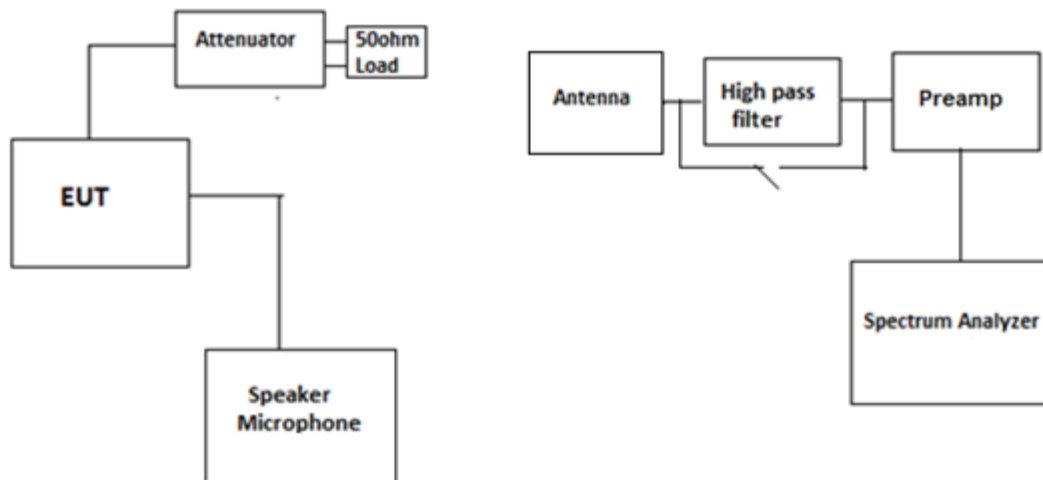
5.6.1. Limits

§ 87.139(a)(3) When the frequency is removed from the assigned frequency by more than 250 percent of the authorized bandwidth the attenuation for aircraft station transmitters must be at least 40 dB; and the attenuation for aeronautical station transmitters must be at least $43 + 10 \log_{10} pY$ dB.

5.6.2. Method of Measurements

ANSI C63.26 Section 5.5.

5.6.3. Test Arrangement



5.6.4. Test Data

Remark(s):

- The emissions were scanned from 30 MHz to 2 GHz; all spurious emissions that are in excess of 20dB below the specified limit shall be recorded.
- There was no difference in spurious/harmonic emissions on the pre-scans for different channel spacing and input voltage levels. Therefore, the RF spurious/harmonic emissions in this section would be performed for 25 kHz channel spacing and limit of $43 + 10 \log_{10} \text{ pY dB}$ applied for worst case.

Carrier Frequency:		118.025 MHz				
Power:		1.76 W				
Limit:		-13 dBm				
Frequency (MHz)	E-Field (dBμV/m)	EMI Detector (Peak/QP)	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
30 - 2000	*	Peak	V/H	*	-13	*

* Spurious emissions are more than 20 dB below the applicable limit.

Carrier Frequency:		127.525MHz				
Power:		1.74 W				
Limit:		-13 dBm				
Frequency (MHz)	E-Field (dBμV/m)	EMI Detector (Peak/QP)	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
30 - 2000	*	Peak	V/H	*	-13	*

* Spurious emissions are more than 20 dB below the applicable limit.

Carrier Frequency:		136.975 MHz				
Power:		1.77 W				
Limit:		-13 dBm				
Frequency (MHz)	E-Field (dBμV/m)	EMI Detector (Peak/QP)	Antenna Polarization (V/H)	ERP (dBm)	Limit (dBm)	Margin (dB)
30 - 2000	*	Peak	V/H	*	-13	*

* Spurious emissions are more than 20 dB below the applicable limit.

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5.7. FREQUENCY STABILITY [§§ 2.1055 & 87.133]

5.7.1. Limits

§ 87.133 The carrier frequency of each station must be maintained within the tolerance in the following table:

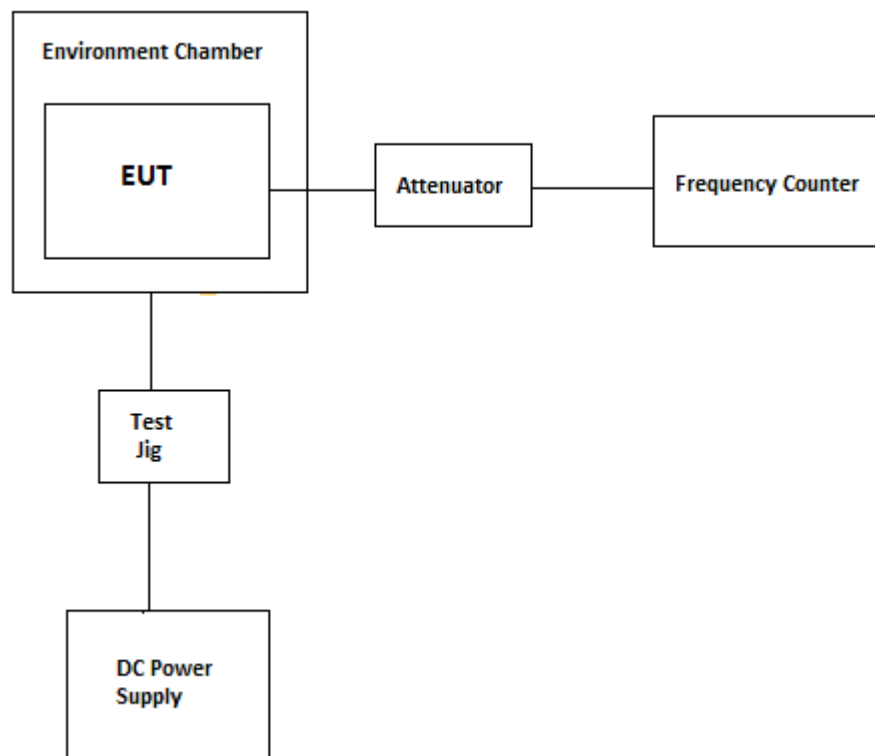
Frequency band (lower limit exclusive, upper limit inclusive), and categories of station	Tolerance (ppm)
(5) Band - 108 to 137 MHz: Aircraft and other mobile stations in the Aviation Services.	*30

* For emissions G1D and G7D, the tolerance is 5 parts per 10^6 .

5.7.2. Method of Measurements

ANSI C63.26 Section 5.6.

5.7.3. Test Arrangement



5.7.4. Test Data

Center Frequency:		118.025 MHz	
Full Power Level:		1.86 W	
Frequency Tolerance Limit (Worst Case):		30 ppm or 3541 Hz (Manufacturer's rating: ± 0.4 kHz)	
Max. Frequency Tolerance Measured:		0.30 ppm or -35 Hz	
Input Voltage Rating:		7.2 VDC	
Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 7.2 VDC	Supply Voltage (Battery end point) 5.9 VDC	Supply Voltage (115% of 7.2 VDC) 8.28 VDC
-30	-35	--	--
-20	-19	--	--
-10	12	--	--
0	8	--	--
+10	-5	--	--
+20	-6	-7	-6
+30	-6	--	--
+40	-12	--	--
+50	-15	--	--
+60	-24	--	--

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EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Power Meter	HP	436A	2709A27515	100 kHz-sensor dependant	17 Jul 2022
Power Sensor	HP	8482A	2652A14099	0.1 MHz - 4.2 GHz	11 Mar 2022
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC - 18GHz	See Note 1
Power Supply	Tenma	72-6153	-	1-18V, DC 10A	See Note 1
Multimeter	Fluke	8842A	5021295	---	12 Jan 2023
Modulation Analyzer	HP	HP-8901B	3226A04606	150 kHz - 1300 MHz	17 Mar 2022
AF Signal Generator	HP	HP-8920B	US39064699	30 MHz - 1 GHz	17 Mar 2022
Digital Voltmeter	HP	3456A	2015A04523	--	21 Jan 2022
FFT Digital Spectrum Analyzer	Advantest	R9211E	8202336	10 mHz - 100 KHz	02 Nov 2022
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20 Hz - 26.5 GHz	20 Sep 2023
Hi-pass filter	Mini-Circuit	SHP-250	--	Cut off 250 MHz	See Note 1
Multimeter	Fluke	8842A	5021295	---	12 Jan 2023
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz - 40 GHz	01 Sep 2022
Biconilog Antenna	EMCO	3142C	00034792	26 - 3000 MHz	16 May 2022
Log Periodic Antenna	ETS	3148	00023845	200 - 2000 MHz	14 Apr 2023
Horn Antenna	ETS	3115	5061	1 - 18 GHz	10 Jun 2022
Horn Antenna	ETS	3115	5955	1 - 18 GHz	12 Oct 2022
Preamplifier	Com-Power	PAM-118A	551016	500 MHz - 18 GHz	15 Mar 2022
Preamplifier	Com-Power	PAM-103	18020181	1 MHz - 1000 MHz	24 Mar 2022
Load(50ohm)	Mini-Circuits	KARN-50+	--	DC - 18 GHz	See Note 1
Environmental Chamber	Envirotronics	SSH32C	11994847-S-11059	-60 to 177 °C	25 Aug 2023
Frequency Counter	EIP	545A	2683	10 MHz - 1 GHz	08 Sep 2022
Attenuator(20dB)	Aeroflex\Weinschel	34-20-34	BP6023	DC - 18 GHz	See Note 1
Attenuator(20dB)	Narda	26298	A577	DC - 1 GHz	See Note 1
Note 1: Internal Verification/Calibration check					

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All test results contained in this engineering test report are traceable to National Institute of Standards and Technology (NIST)

EXHIBIT 7. MEASUREMENT UNCERTAINTY

The measurement uncertainties stated were calculated in accordance with the requirements of CISPR 16-4-2 @ IEC:2003 and JCGM 100:2008 (GUM 1995) – Guide to the Expression of Uncertainty in Measurement.

Test description		Uncertainty
Conducted Output Power		+/- 0.62 dB
Occupied Bandwidth		+/-0.2Hz
Emission Mask / Limitation	Amplitude	+/- 0.63 dB
	Frequency	+/-0.2Hz
Transmitter Conducted Out of Band/Spurious Emissions		+/- 0.72 dB
Transmitter/Receiver Radiated Out of Band/Spurious Emissions	30-1000 MHz	+/-4.20dB
	>1 GHz	+/-2.70dB
Frequency Stability		+/-1.2 Hz
Modulation Limiting		± 1.2%
Audio Frequency Response	Amplitude	± 0.2dB
	Frequency	± 0.2Hz

All uncertainty values are expanded standard uncertainty to give a confidence level of 95%, based on coverage factor k=2