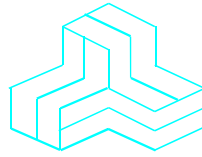


ENGINEERING TEST REPORT



**VHF Marine Transceiver
Model: IC-M73
FCC ID: AFJ349520**

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 80 (Marine in 156.025-157.425 MHz)**

UltraTech's File No.: 21ICOM539_FCC80

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

Date: April 21, 2021

Report Prepared by: Dan Huynh

Tested by: Nimisha Desai

Issued Date: April 21, 2021

Test Dates:
March 16, 17, 18, 22 & 23, 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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1309



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 80
Title:	Code of Federal Regulations (CFR), Title 47 Telecommunication – Parts 2 & 80
Purpose of Test:	FCC Equipment Authorization Certification for Part 80 operating in the following 156.025-157.425 MHz band (Marine).
Test Procedures:	<ul style="list-style-type: none">• ANSI C63.26-2015• ANSI C63.4
Categories of Station:	Ship station transceiver operating in 156.025-157.425 MHz band

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

None.

1.3. NORMATIVE REFERENCES

Publication	Year	Title
FCC CFR Parts 0-19, 80-End	2020	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

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 5302 Fax #: +81 6 6793 0013 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 5302 Fax #: +81 6 6793 0013 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 Marine Transceiver
Model Name or Number:	IC-M73
Serial Number:	00000206
Type of Equipment:	Licensed Non-Broadcast Transmitter Held to Face
Power Supply Requirement:	7.4 VDC nominal
Transmitting/Receiving Antenna Type:	Non-Integral
Primary User Functions of EUT:	VHF Marine Transceiver

2.3. EUT'S TECHNICAL SPECIFICATIONS

Transmitter	
Equipment Type:	Portable
Intended Operating Environment:	Commercial, industrial or business environment
Power Supply Requirement:	7.4 VDC nominal
RF Output Power Rating:	6 / 3 / 1 W
Operating Frequency Range:	156.025 - 157.425 MHz
RF Output Impedance:	50 Ω
Channel Spacing:	25 kHz
Modulation Employed:	Variable reactance FM
Occupied Bandwidth (99%):	14.92 kHz
Emission Designator*:	16K0G3E
Antenna Connector Type:	Screw type

*For Typical Commercial Telephony:

$B_n = 2M + 2DK$, $K = 1$, $D = 5$ and $M = 3$ kHz (for an average case of commercial telephony)

Where:

- B_n = Necessary bandwidth (kHz)
- M = Maximum modulation frequency (kHz)
- D = Peak frequency deviation (kHz)
- K = Constant

Necessary bandwidth calculation:

$$B_n = 2M + 2DK$$
$$B_n = (2 * 3) + (2 * 5 * 1)$$
$$B_n = 16.0$$

Emission Designator: 16K0G3E

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 Connector	1	SMA	Direct Connection
1	Speaker-Microphone Connector	1	4-pin connector	Non-shielded

2.5. ANCILLARY EQUIPMENT

The EUT was tested while connected to the following representative configuration of ancillary equipment necessary to exercise the ports during tests:

Ancillary Equipment # 1	
Description:	Speaker Microphone
Brand name:	Icom
Model Name or Number:	HM 202
Connected to EUT's Port:	Speaker-Microphone Connector

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:	45% to 58%
Pressure:	102 kPa
Power input source:	7.4 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:	N/A
Transmitter Test Antenna:	The EUT is tested with the transmitter antenna port terminated to a 50 Ω Load.

Transmitter Test Signals	
Frequency Band(s):	156.025-157.425 MHz
Test Frequency(ies):	156.050 MHz and 157.425MHz
Transmitter Wanted Output Test Signals:	
<ul style="list-style-type: none"> • Transmitter Power (measured maximum output power): • Normal Test Modulation: • Modulating signal source: 	<p>37.52 dBm (5.65 W)</p> <p>FM Voice</p> <p>External</p>

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 & 80.215	RF Power Output	Yes
2.1047(a) & 80.213(e)	Modulation Characteristics - Audio Frequency Response	Yes
2.1047(b) & 80.213	Modulation Characteristics - Modulation Limiting	Yes
2.1049, 80.205 & 80.211(f)	Occupied Bandwidth and Emission Limitations	Yes
2.1051, 2.1057 & 80.211(f)(3)	Spurious Emissions at Antenna Terminals	Yes
2.1053, 2.1057 & 80.211(f)(3))	Field Strength of Spurious Radiation	Yes
2.1055 & 80.209	Frequency Stability	Yes
80.217	Suppression of Interference aboard ships	Yes
1.1307, 1.1310 & 2.1093	Radiofrequency Radiation Exposure Evaluation	Yes*

* Refer to SAR test report.

4.3. MODIFICATIONS INCORPORATED IN THE EUT FOR COMPLIANCE PURPOSES

None.

4.4. DEVIATION OF STANDARD TEST PROCEDURES

None.

ULTRATECH GROUP OF LABS

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File #: 211COM539_FCC80
April 21, 2021

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

EXHIBIT 5. TEST DATA

5.1. RF POWER OUTPUT [§§ 2.1046 & 80.215]

5.1.1. Limits

§ 80.215(e) Ship stations frequencies above 27500 kHz. The maximum power must not exceed the values listed below.

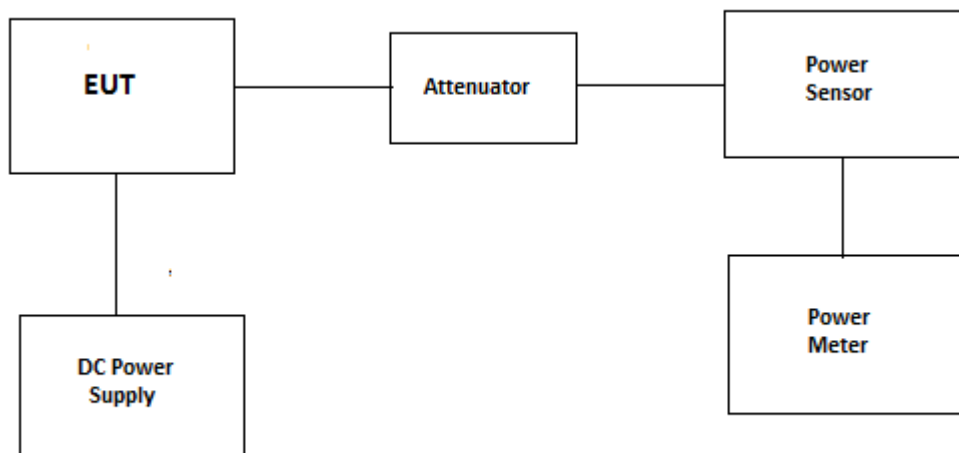
(1) Ship stations 156–162 MHz - 25W¹.

¹Reducible to 1 watt or less, except for transmitters limited to public correspondence channels and used in an automated system.

5.1.2. Method of Measurements

ANSI C63.26 Section 5.2.

5.1.3. Test Arrangement



5.1.4. Test Data

Power Setting Level	CH no.	Frequency (MHz)	Measured Output Power		Rated Output Power (W)
			(dBm)	(W)	
High	01A	156.050	37.52	5.65	6.0
	88	157.425	37.48	5.60	6.0
Middle	01A	156.050	34.80	3.02	3.0
	88	157.425	34.78	3.01	3.0
Low	01A	156.050	28.83	0.76	1.0
	88	157.425	28.82	0.76	1.0

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

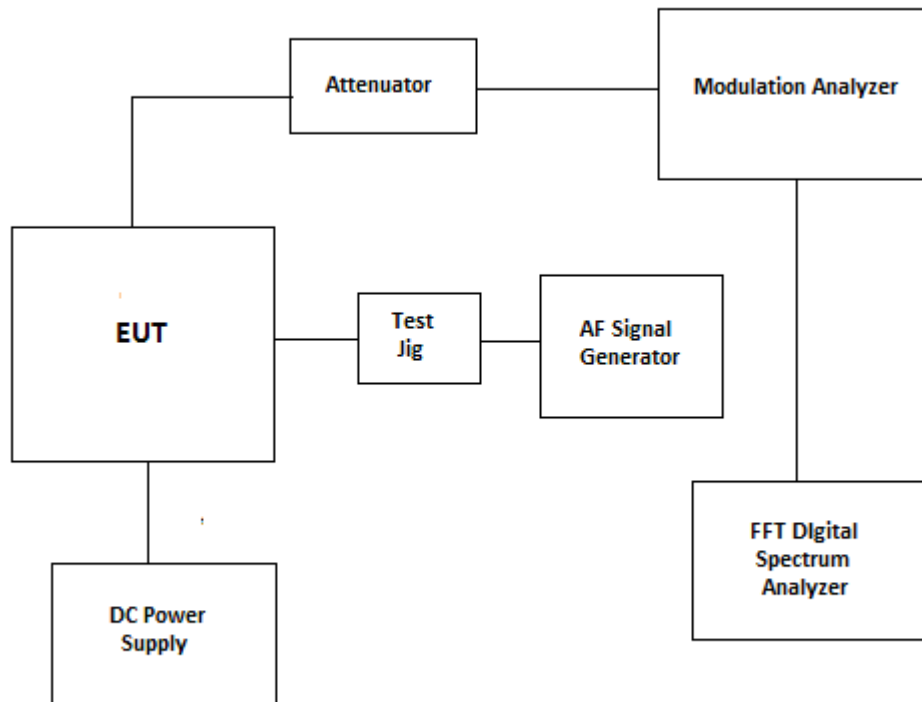
5.2.1. Limits

§2.1047(a) *Voice modulated communication equipment.* A curve or equivalent data showing the frequency response of the audio modulating circuit over a range of 100 to 5000 Hz shall be submitted. For equipment required to have an audio low-pass filter, a curve showing the frequency response of the filter, or of all circuitry installed between the modulation limiter and the modulated stage shall be submitted.

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

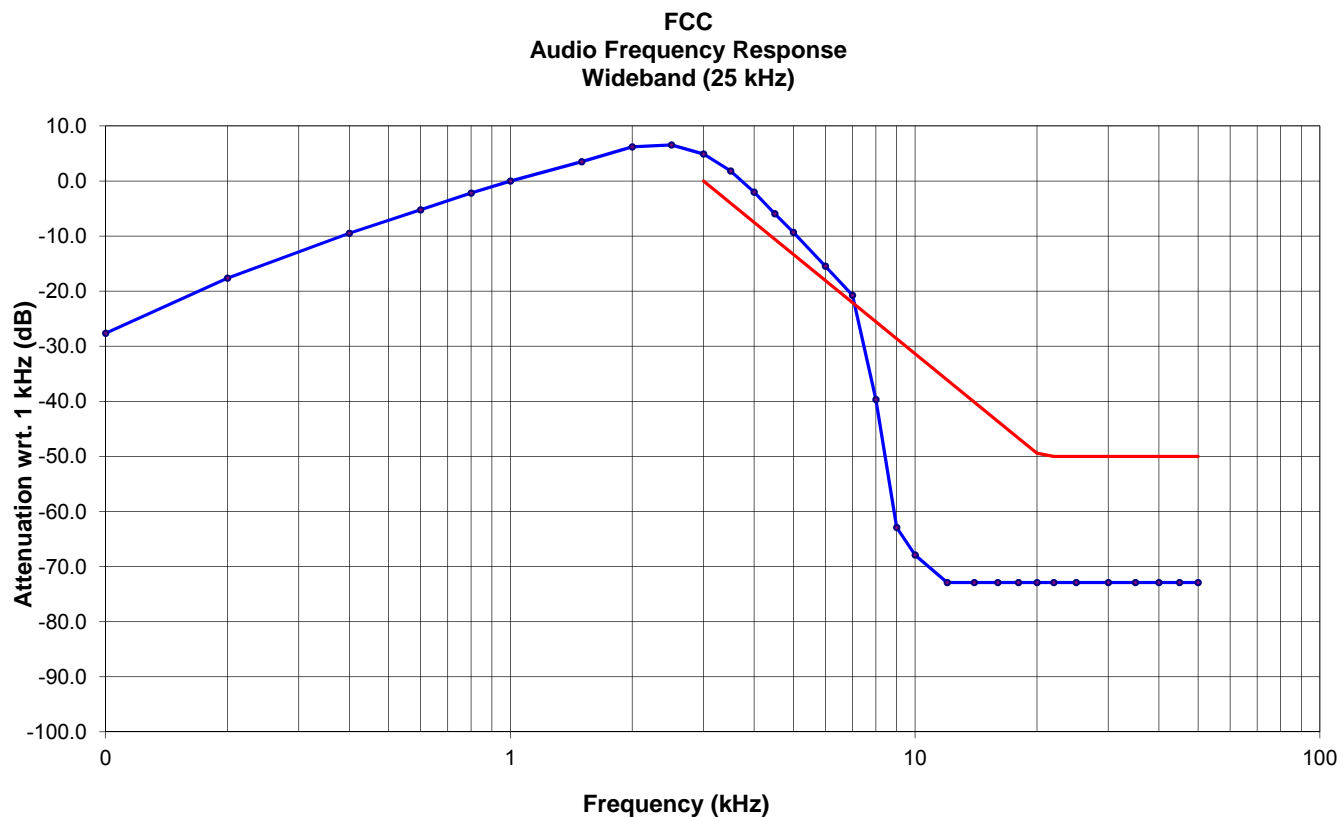


5.2.4. Test Data

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.

Audio Frequency Response of All Modulation States for Wideband (25 kHz)

Frequency (kHz)	Audio IN (dBV)	Audio OUT (dBV)	Attenuation (OUT - IN) (dB)	Attenuation wrt. 1 kHz (dB)	Recommended Attenuation (dB)
0.1	-54.89	-24.75	30.1	-27.6	--
0.2	-54.89	-14.74	40.2	-17.6	--
0.4	-54.89	-6.59	48.3	-9.5	--
0.6	-54.89	-2.34	52.6	-5.2	--
0.8	-54.89	0.71	55.6	-2.2	--
1.0	-54.89	2.89	57.8	0.0	--
1.5	-54.89	6.40	61.3	3.5	--
2.0	-54.89	9.09	64.0	6.2	--
2.5	-54.89	9.45	64.3	6.6	--
3.0	-54.89	7.80	62.7	4.9	0
3.5	-54.89	4.72	59.6	1.8	-4
4.0	-54.89	0.88	55.8	-2.0	-7
4.5	-54.89	-3.04	51.9	-5.9	-11
5.0	-54.89	-6.42	48.5	-9.3	-13
6.0	-54.89	-12.56	42.3	-15.5	-18
7.0	-54.89	-17.85	37.0	-20.7	-22
8.0	-54.89	-36.78	18.1	-39.7	-26
9.0	-54.89	-60.00	-5.1	-62.9	-29
10.0	-54.89	-65.00	-10.1	-67.9	-31
12.0	-54.89	-70.00	-15.1	-72.9	-36
14.0	-54.89	-70.00	-15.1	-72.9	-40
16.0	-54.89	-70.00	-15.1	-72.9	-44
18.0	-54.89	-70.00	-15.1	-72.9	-47
20.0	-54.89	-70.00	-15.1	-72.9	-49
22.0	-54.89	-70.00	-15.1	-72.9	-50
25.0	-54.89	-70.00	-15.1	-72.9	-50
30.0	-54.89	-70.00	-15.1	-72.9	-50
35.0	-54.89	-70.00	-15.1	-72.9	-50
40.0	-54.89	-70.00	-15.1	-72.9	-50
45.0	-54.89	-70.00	-15.1	-72.9	-50
50.0	-54.89	-70.00	-15.1	-72.9	-50



5.3. MODULATION CHARACTERISTICS – MODULATION LIMITING [§§2.1047(b) & 80.213]

5.3.1. Limits

§ 80.213 (a)(2) When phase or frequency modulation is used in the 156-162 MHz band the peak modulation must be maintained between 75 and 100 percent. A frequency deviation of ± 5 kHz is defined as 100 percent peak modulation; and

§ 80.213 (b) Radiotelephone transmitters using A3E, F3E and G3E emission must have a modulation limiter to prevent any modulation over 100 percent. This requirement does not apply to survival craft transmitters, to transmitters that do not require a license or to transmitters whose output power does not exceed 3 watts.

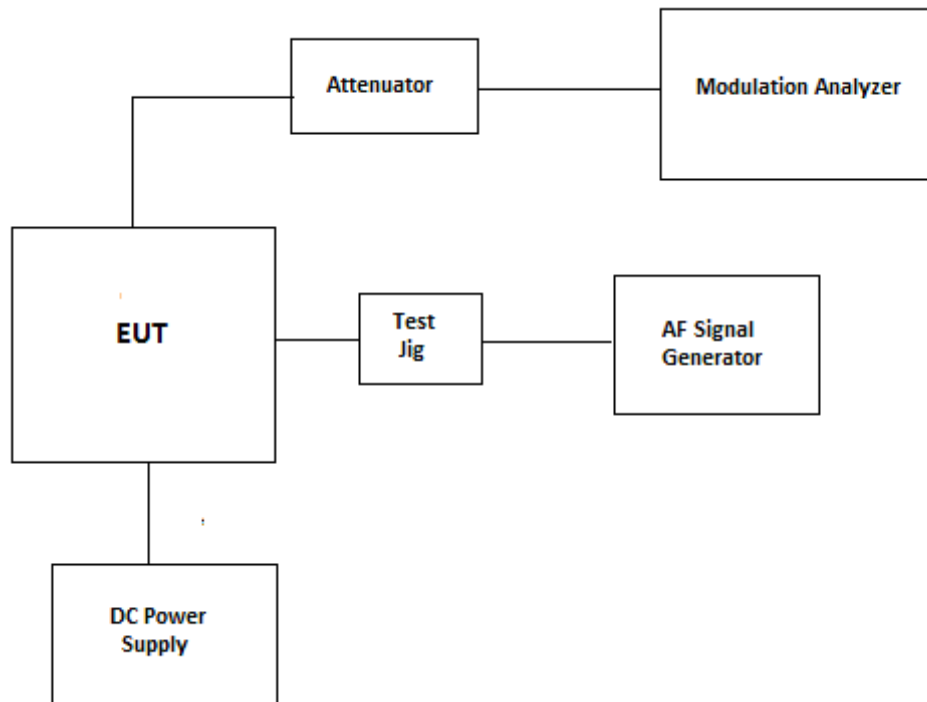
§ 80.213 (d) Ship and coast station transmitters operating in the 156-162 MHz and 216-220 bands must be capable of proper operation with a frequency deviation that does not exceed ± 5 kHz when using any emission authorized by §80.207

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

Modulating Signal Level (mVrms)	Peak Modulation Deviation (kHz)					Maximum Limit (kHz)
	0.1 kHz	0.5 kHz	1.0 kHz	3.0 kHz	5.0 kHz	
2	0.87	1.67	2.90	3.89	1.29	5.0
4	0.91	2.68	4.27	3.80	1.05	5.0
6	0.99	3.64	4.36	3.76	0.99	5.0
8	1.01	3.77	4.36	3.75	0.96	5.0
10	1.16	3.83	4.35	3.77	0.92	5.0
15	1.45	4.22	4.34	3.70	0.87	5.0
20	1.76	4.24	4.34	3.69	0.83	5.0
25	1.81	4.25	4.30	3.70	0.81	5.0
30	2.30	4.24	4.30	3.70	0.79	5.0
35	2.42	4.23	4.30	3.68	0.77	5.0
40	2.64	4.22	4.29	3.68	0.77	5.0
45	2.94	4.22	4.28	3.68	0.79	5.0
50	3.32	4.21	4.28	3.66	0.76	5.0
60	4.85	4.20	4.28	3.65	0.75	5.0
70	4.87	4.19	4.27	3.64	0.75	5.0
80	4.80	4.18	4.27	3.63	0.75	5.0
90	4.78	4.16	4.26	3.63	0.75	5.0
100	4.76	4.15	4.26	3.63	0.75	5.0

Remarks		
Standard Modulation Level: 1.8 mV = 5.11 dB (mVrms) Voice Signal Input Level: Standard Modulation Level + 16 dB = 5.11 dB (mVrms) + 16 dB = 21.11 dB (mVrms) = 11.36 mVrms		
Modulation Frequency (kHz)	Peak Depth (kHz)	Maximum Limit (kHz)
0.1	1.25	5.0
0.2	2.54	5.0
0.4	3.80	5.0
0.6	4.23	5.0
0.8	4.27	5.0
1.0	4.31	5.0
1.2	4.28	5.0
1.4	4.26	5.0
1.6	4.27	5.0
1.8	4.31	5.0
2.0	4.37	5.0
2.5	4.33	5.0
3.0	3.72	5.0
3.5	2.66	5.0
4.0	1.78	5.0
4.5	1.21	5.0
5.0	0.88	5.0
6.0	0.55	5.0
7.0	0.42	5.0
8.0	0.84	5.0
9.0	0.87	5.0
10.0	0.84	5.0

5.4. OCCUPIED BANDWIDTH AND EMISSION MASKS [§§ 2.1049, 80.205 & 80.211]

5.4.1. Limits

§80.205 (a) An emission designator shows the necessary bandwidth for each class of emission of a station except that in ship earth stations it shows the occupied or necessary bandwidth, whichever is greater. The following table gives the class of emission and corresponding emission designator and authorized bandwidth:

Class of emission	Emission designator	Authorized bandwidth (kHz)
G3E*	16KOG3E	20.0

*Applicable only when maximum frequency deviation is 5 kHz

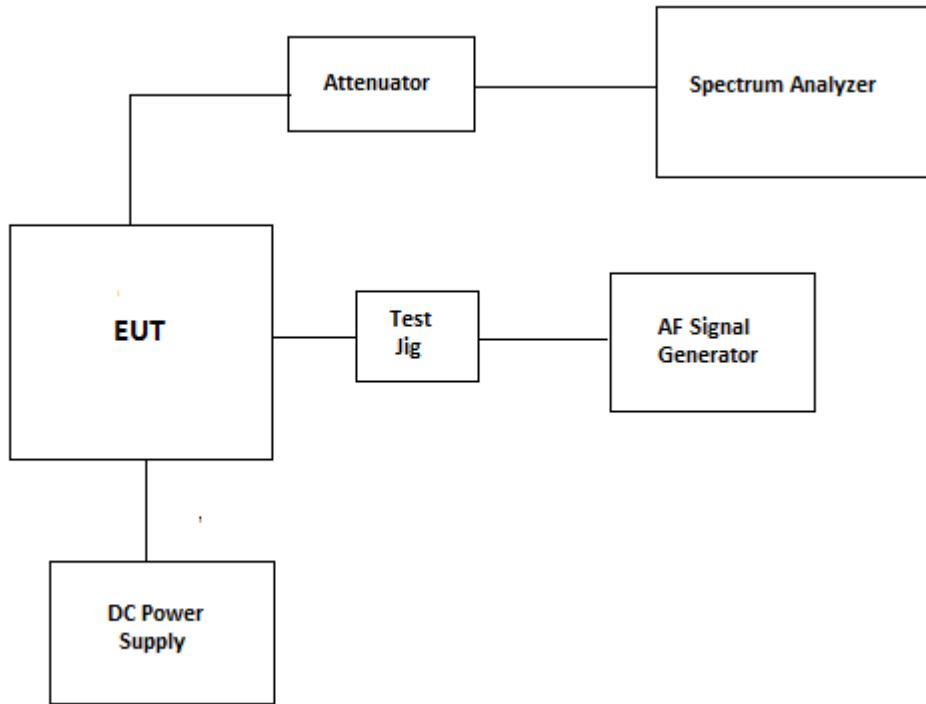
§ 80.211 (f) Emission Limitations:

- (1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 100 percent of the authorized bandwidth: At least 25 dB;
- (2) On any frequency removed from the assigned frequency by more than 100 percent up to and including 250 percent of the authorized bandwidth: At least 35 dB; and
- (3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) 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



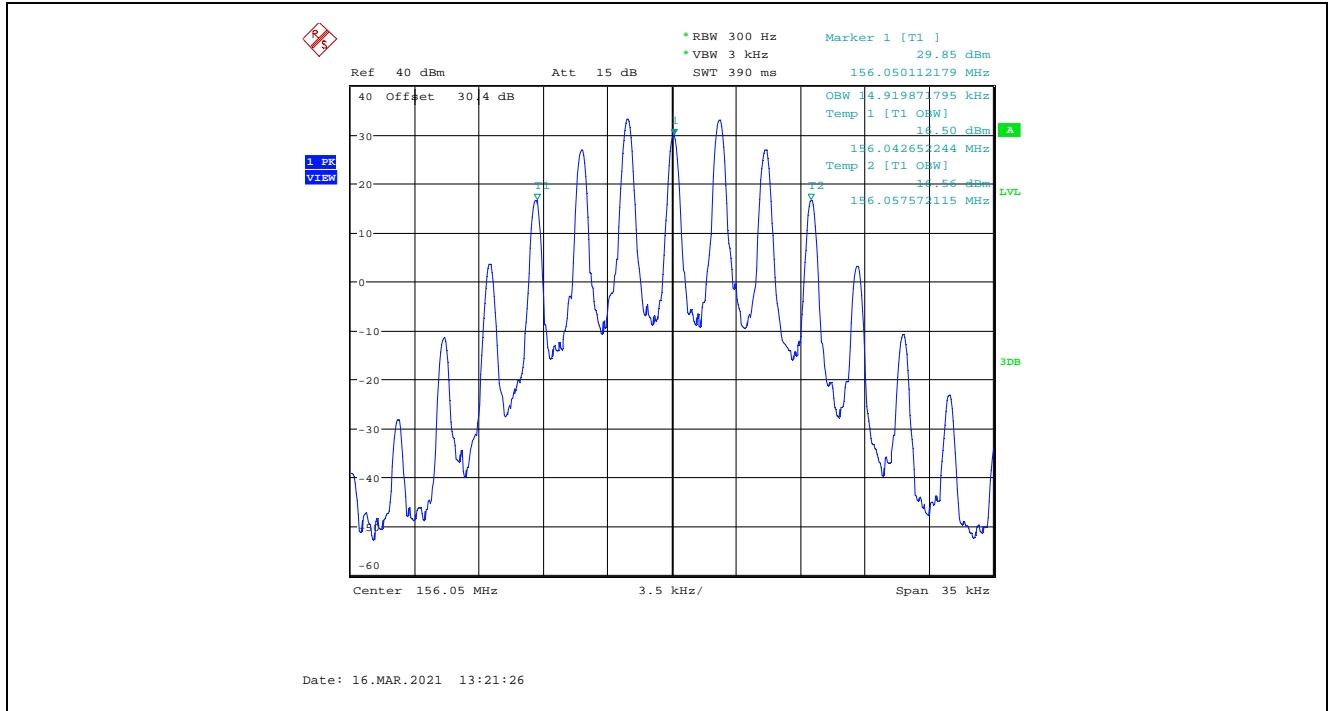
5.4.4. Test Data

5.4.4.1. 99% Occupied Bandwidth

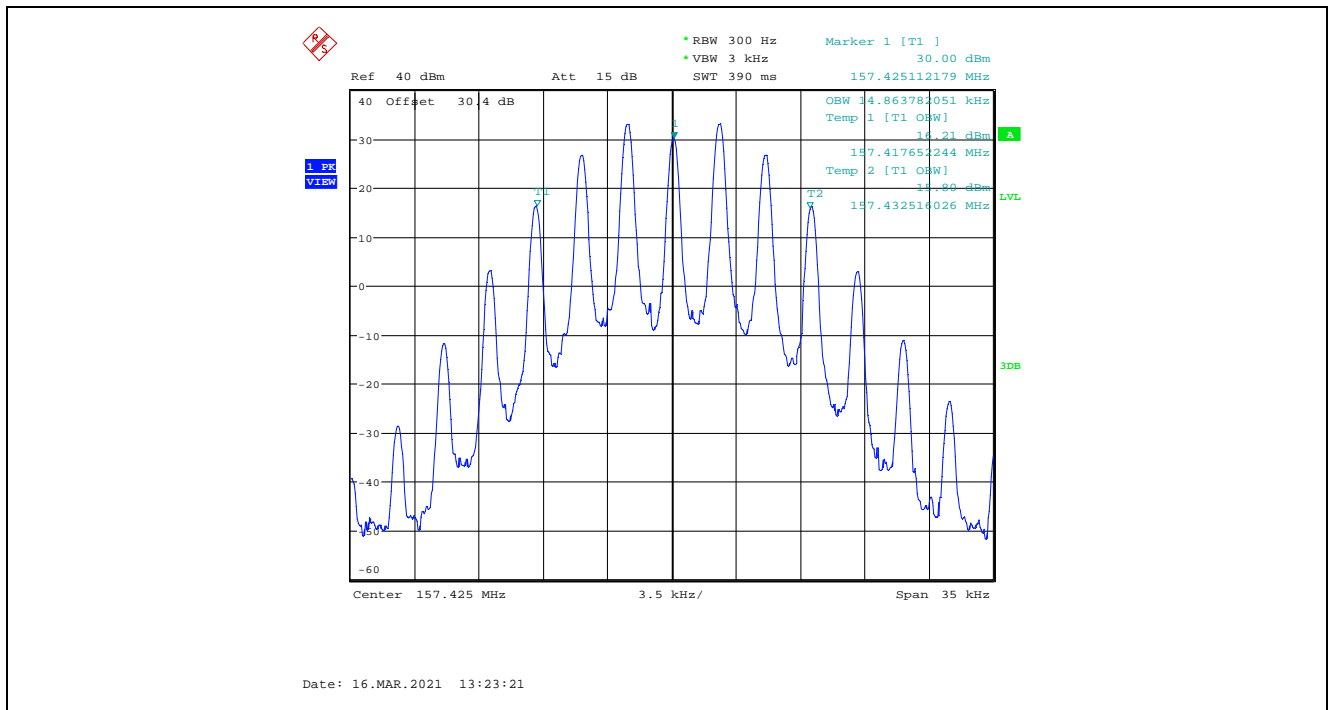
Channel	Frequency (MHz)	99% Occupied Bandwidth (kHz)
CH 01A	156.050MHz	14.92
CH 88	157.425MHz	14.86

* See the following plots for details of measurements

Plot 5.4.4.1.1. 99% Occupied Bandwidth, CH 01A, 156.050 MHz, High Power

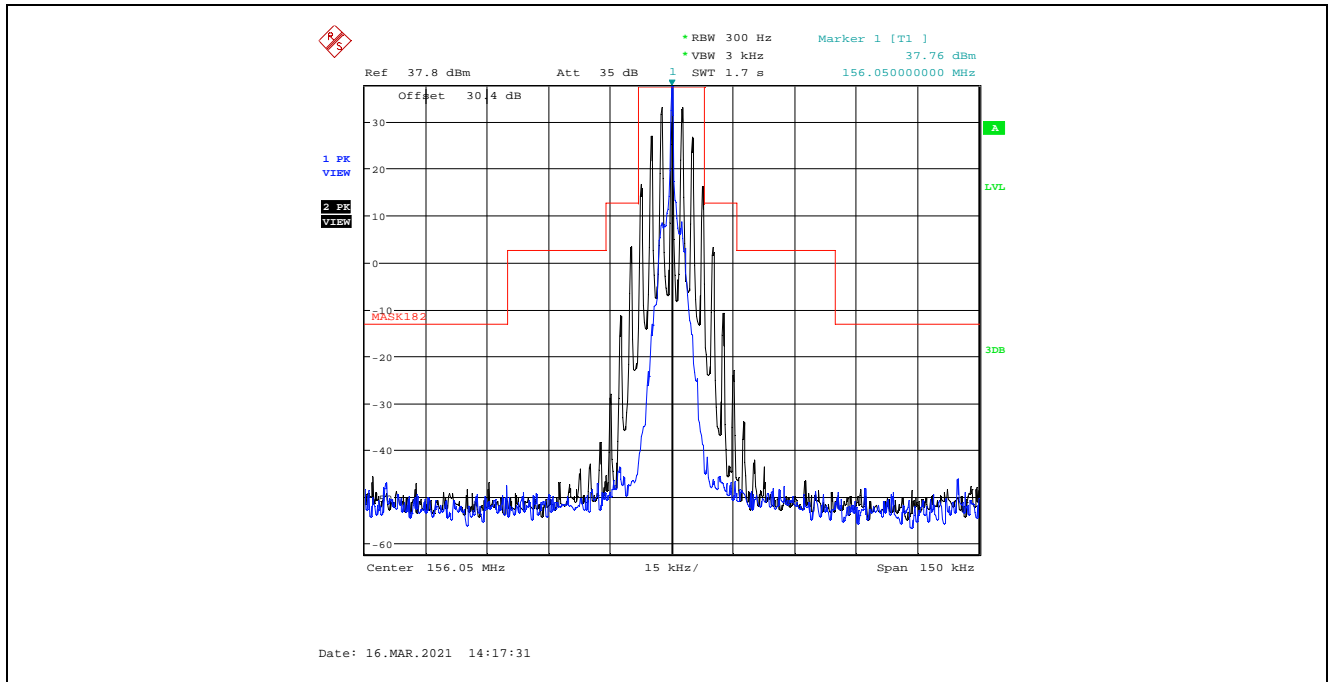


Plot 5.4.4.1.2. 99% Occupied Bandwidth, CH 88, 157.425 MHz, High power

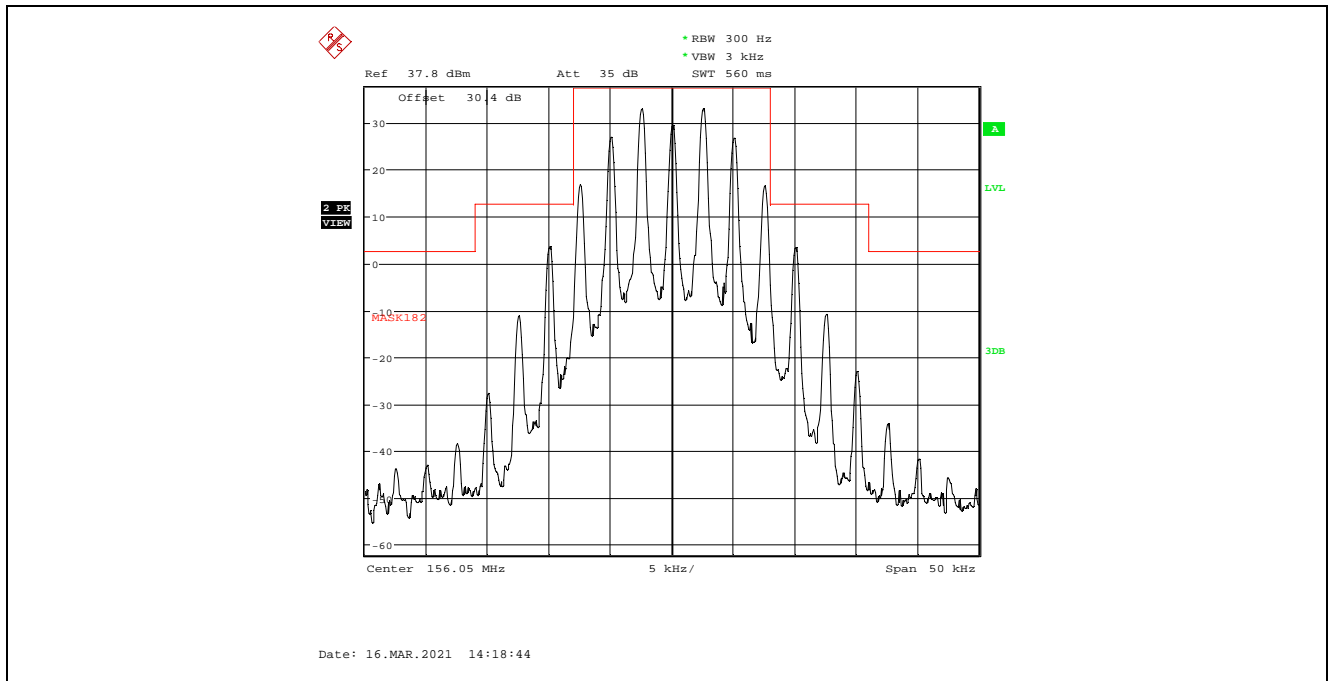


5.4.4.2. Emission Mask

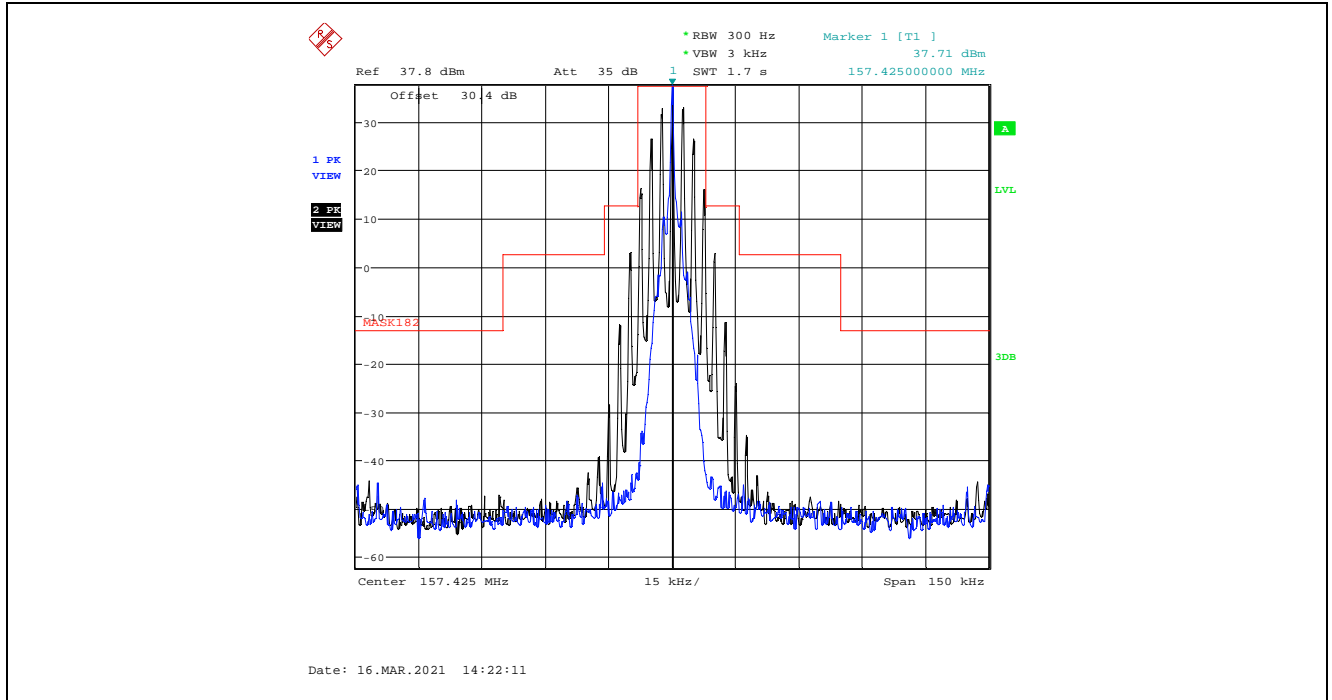
Plot 5.4.4.2.1. § 80.211 (f) Emission Limitations, CH 01A 156.050MHz, High Power, Span 150 kHz



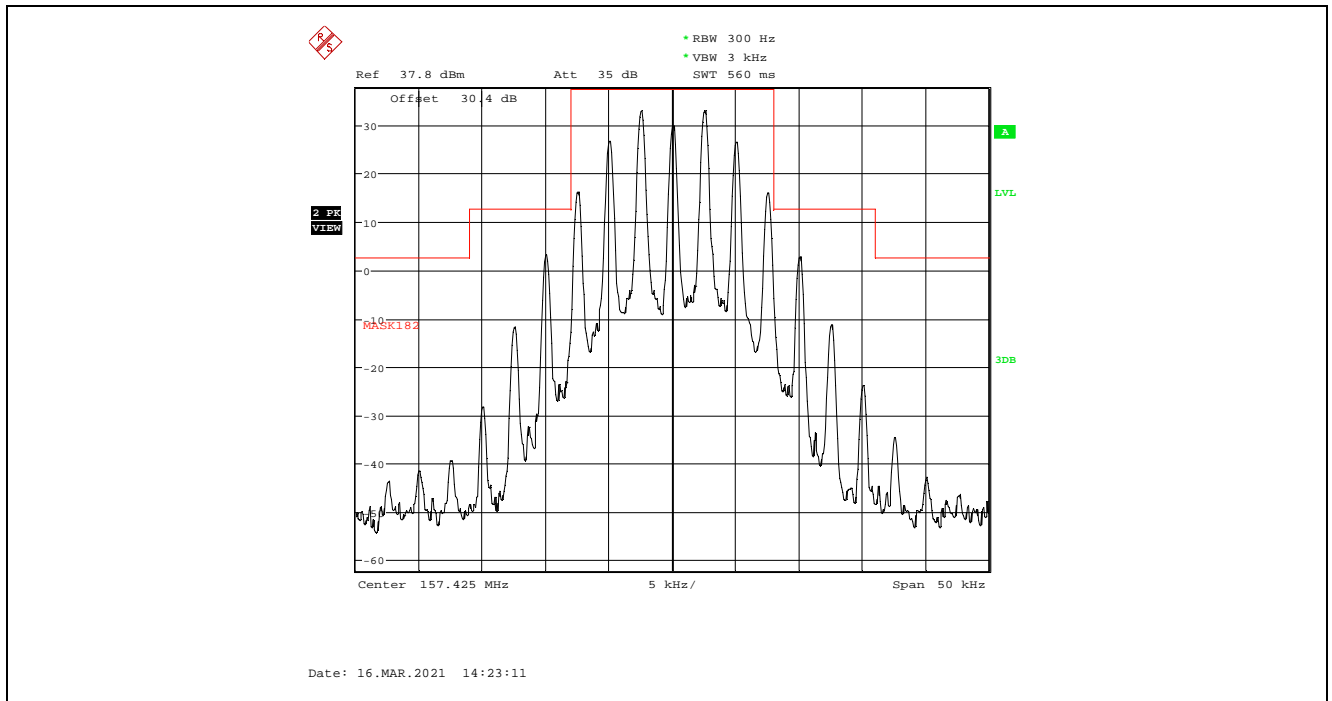
Plot 5.4.4.2.2. § 80.211 (f) Emission Limitations, CH 01A 156.050MHz, High Power, Span 50 kHz



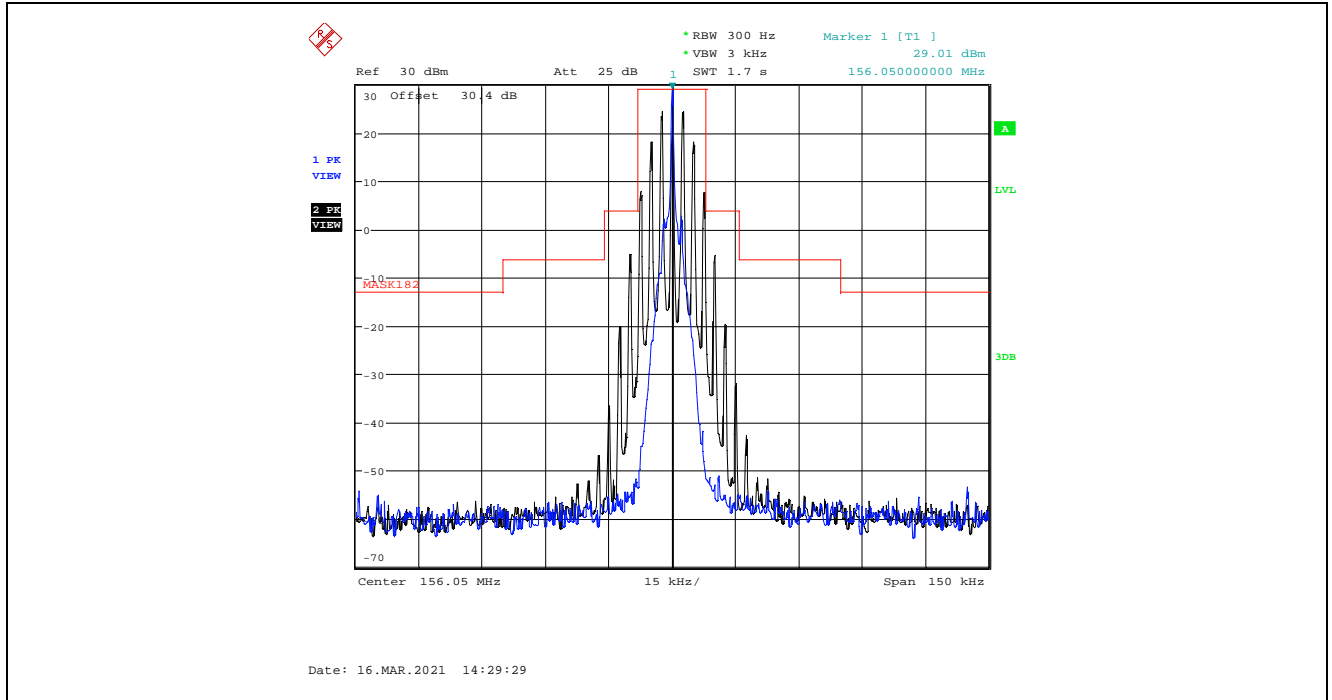
Plot 5.4.4.2.3. § 80.211 (f) Emission Limitations, CH 88 157.425MHz, High Power, Span 150 kHz



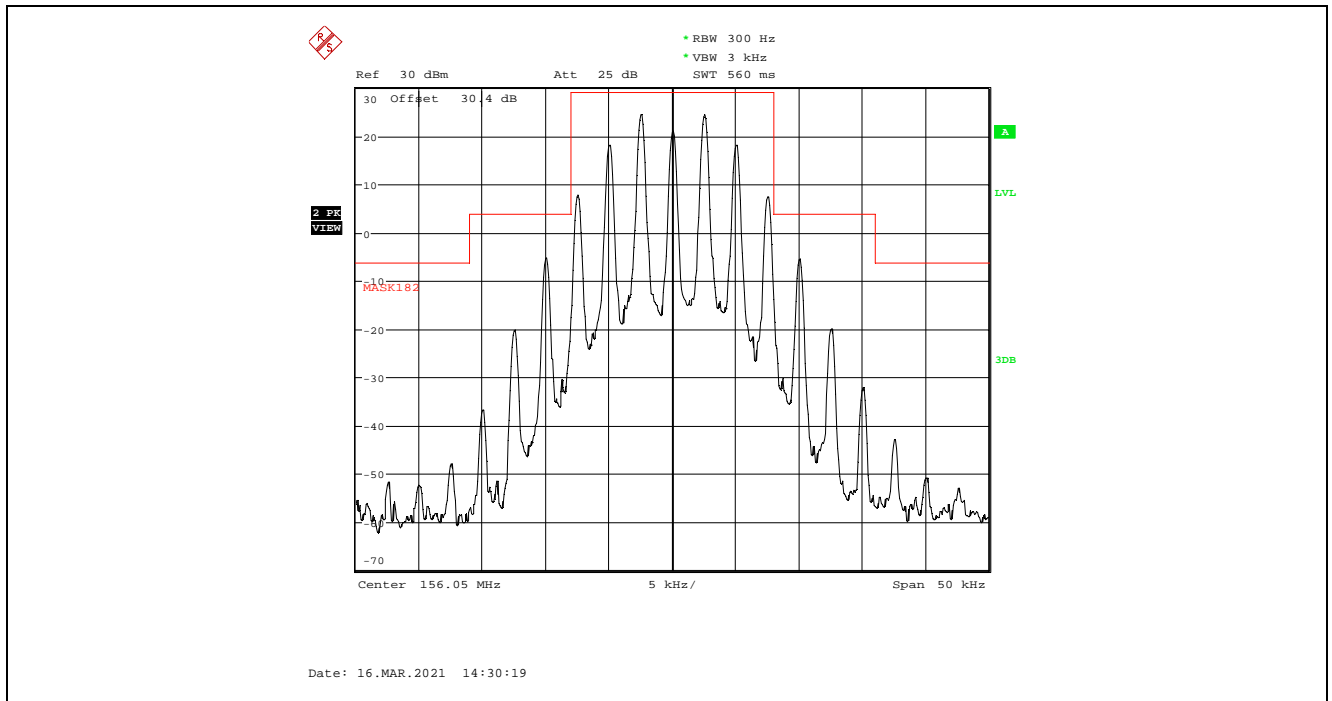
Plot 5.4.4.2.4. § 80.211 (f) Emission Limitations, CH 88 157.425MHz, High Power, Span 50 kHz



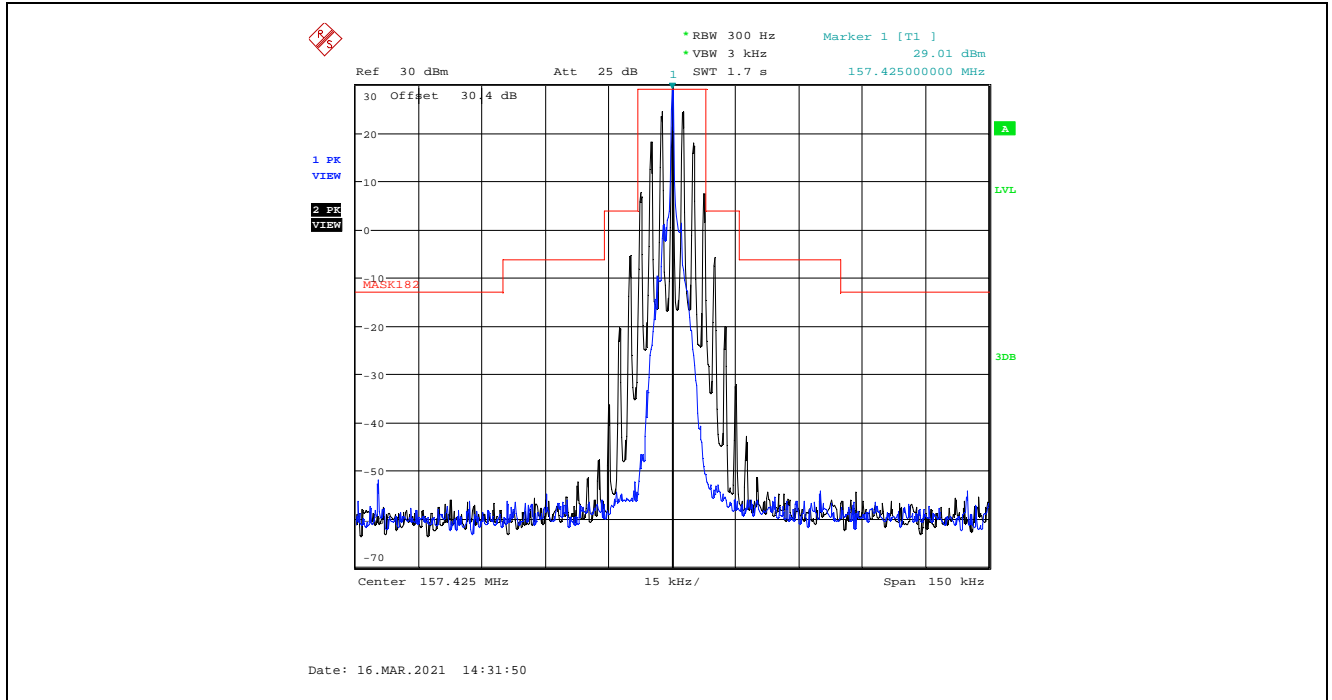
Plot 5.4.4.2.5. § 80.211 (f) Emission Limitations, CH 01A 156.050MHz, Low Power, Span 150 kHz



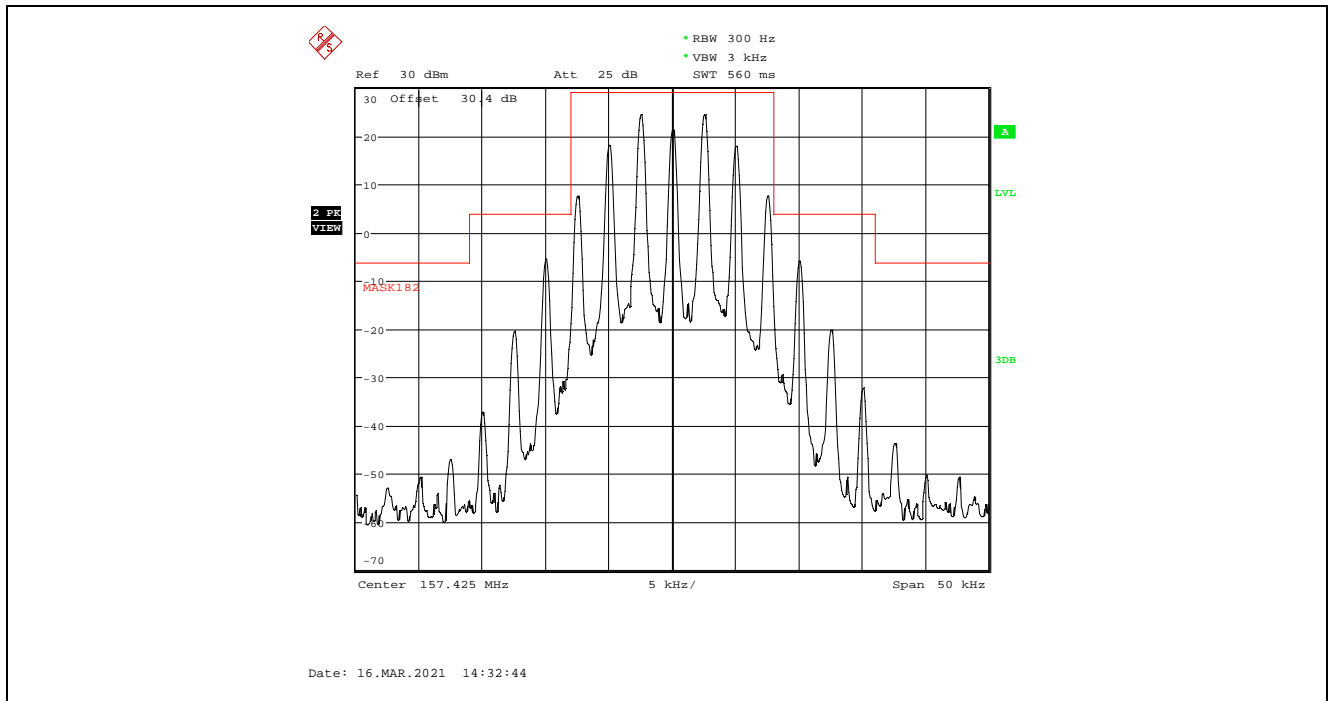
Plot 5.4.4.2.6. § 80.211 (f) Emission Limitations, CH 01A 156.050MHz, Low Power, Span 50 kHz



Plot 5.4.4.2.7. § 80.211 (f) Emission Limitations, CH 88 157.425MHz, Low Power, Span 150 kHz



Plot 5.4.4.2.8. § 80.211 (f) Emission Limitations, CH 88 157.425MHz, Low Power, Span 50 kHz



5.5. TRANSMITTER SPURIOUS EMISSIONS AT ANTENNA TERMINALS [§§ 2.1051 & 80.211(f)(3)]

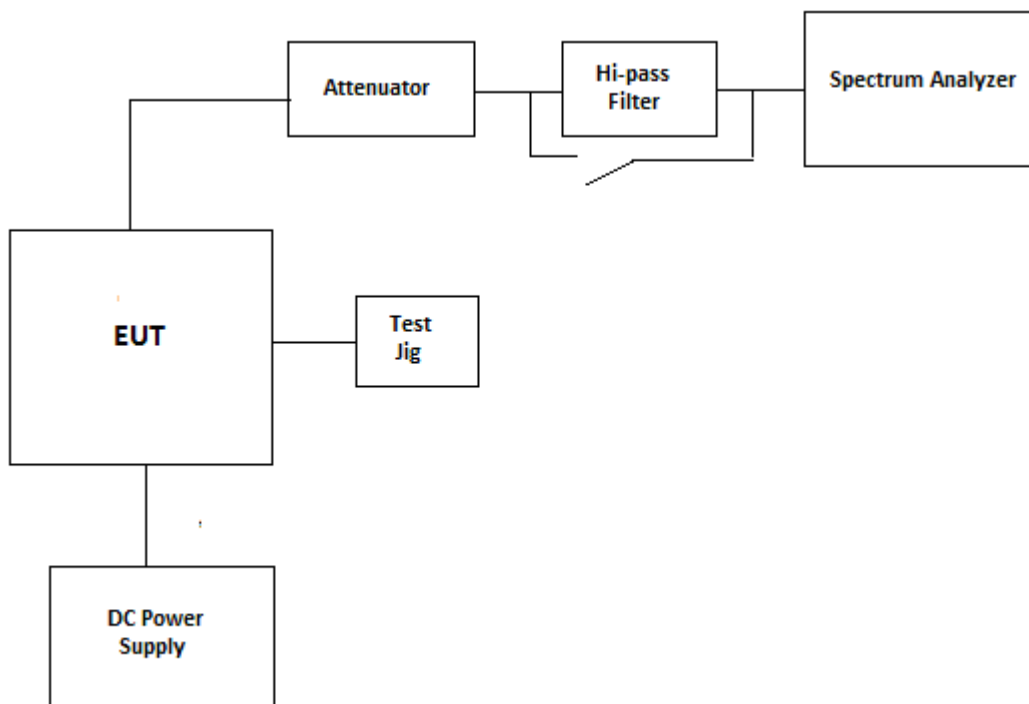
5.5.1. Limits

§80.211(f)(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) dB.

5.5.2. Method of Measurements

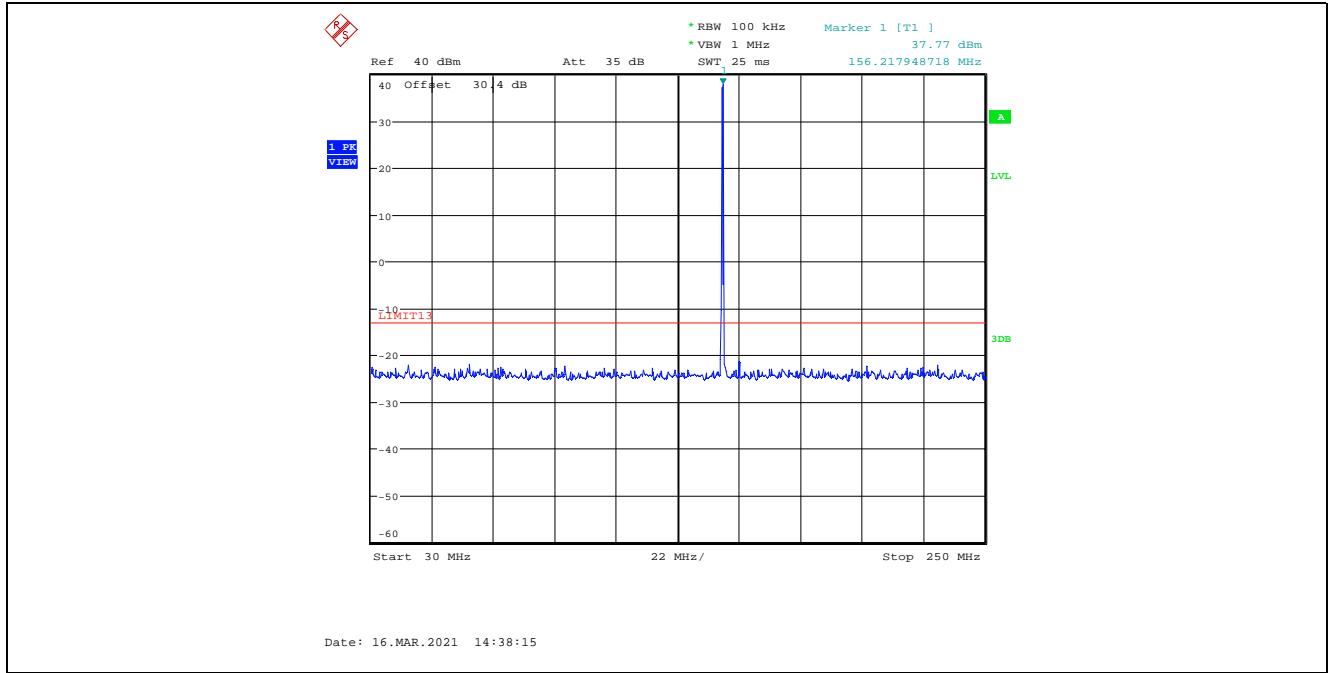
ANSI C63.26 Section 5.7.

5.5.3. Test Arrangement

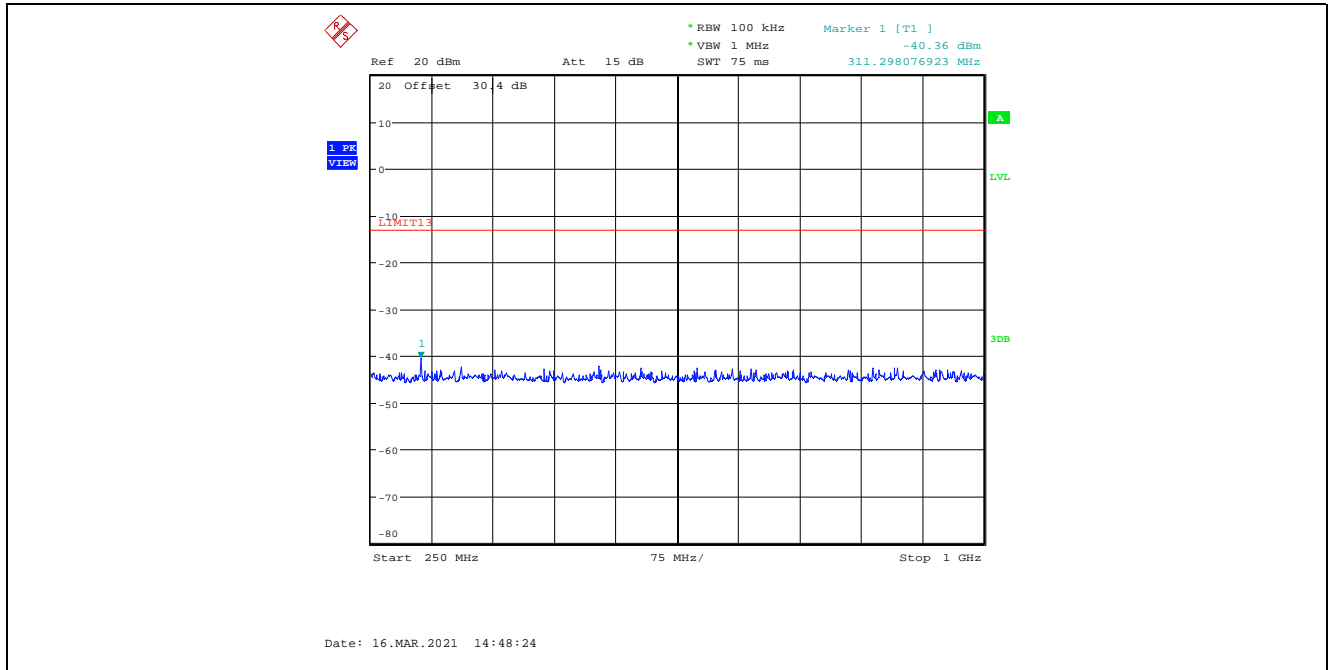


5.5.4. Test Data

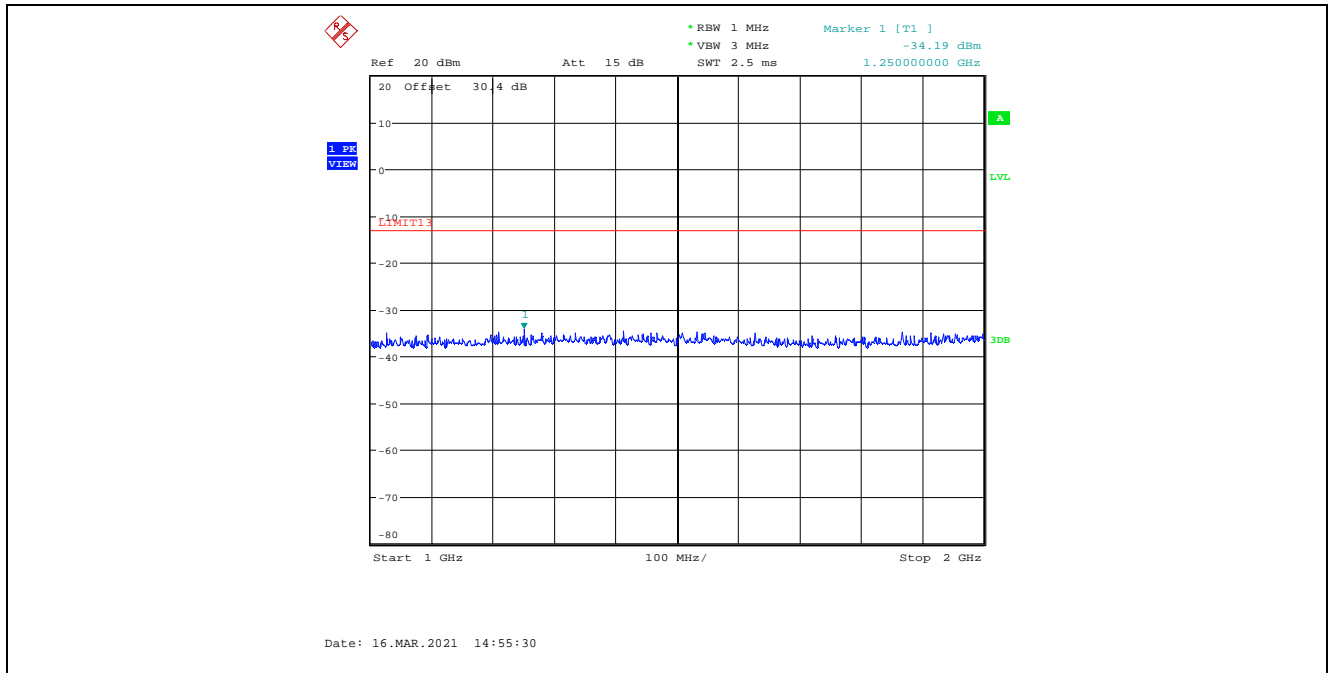
Plot 5.5.4.1. Transmitter Spurious Emissions at Antenna Terminal, CH 01A, 156.050 MHz, High Power
30 - 250 MHz



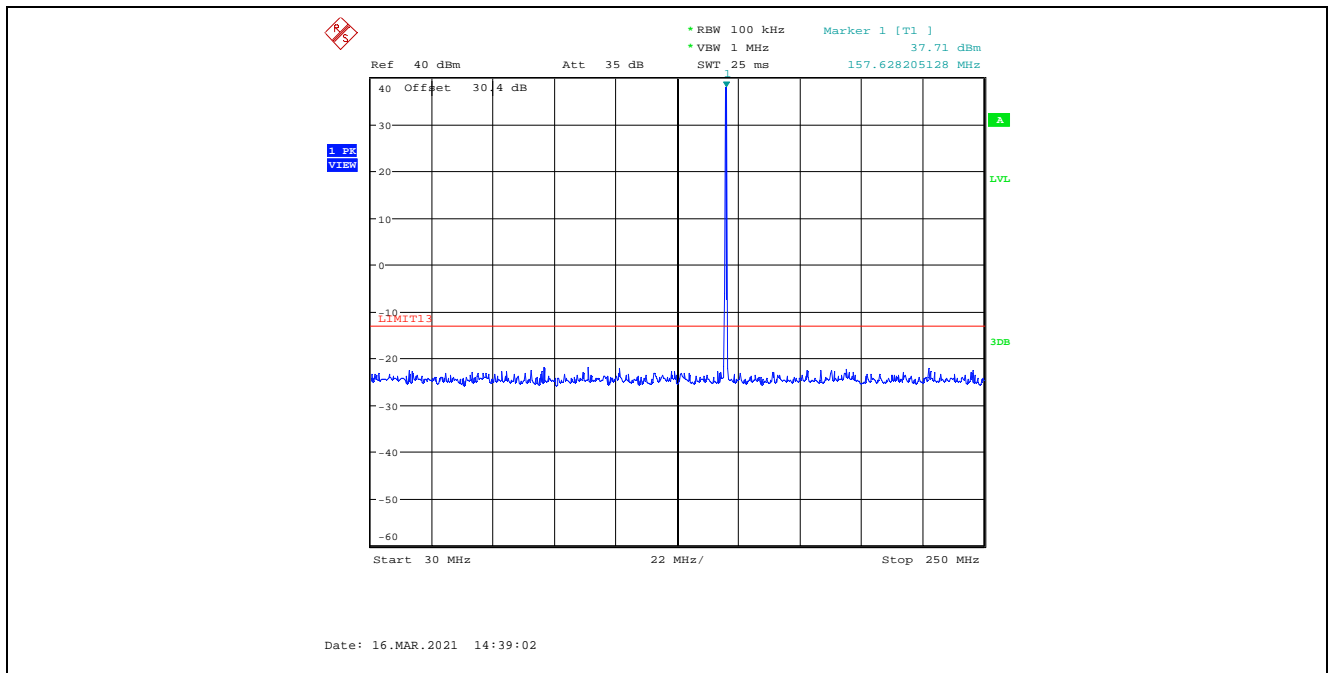
Plot 5.5.4.2. Transmitter Spurious Emissions at Antenna Terminal, CH 01A, 156.050 MHz, High Power
250 MHz – 1 GHz



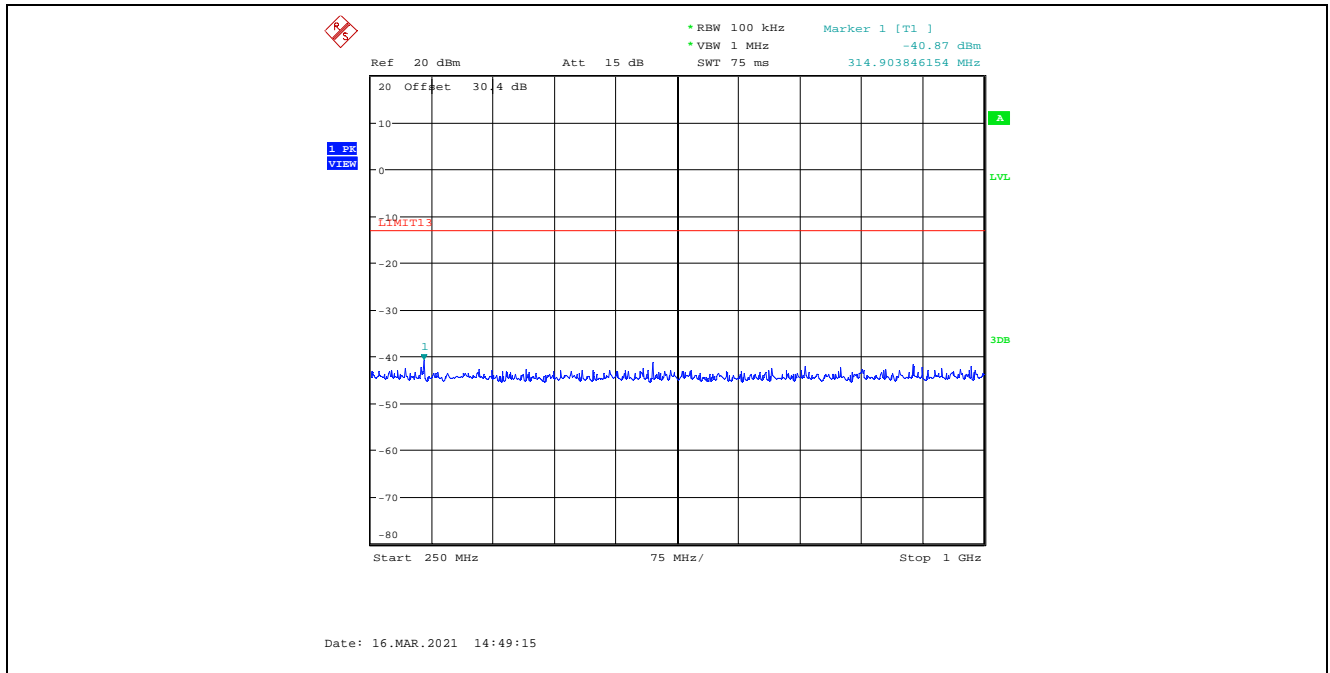
Plot 5.5.4.3. Transmitter Spurious Emissions at Antenna Terminal, CH 01A, 156.050 MHz, High Power
1 GHz – 2 GHz



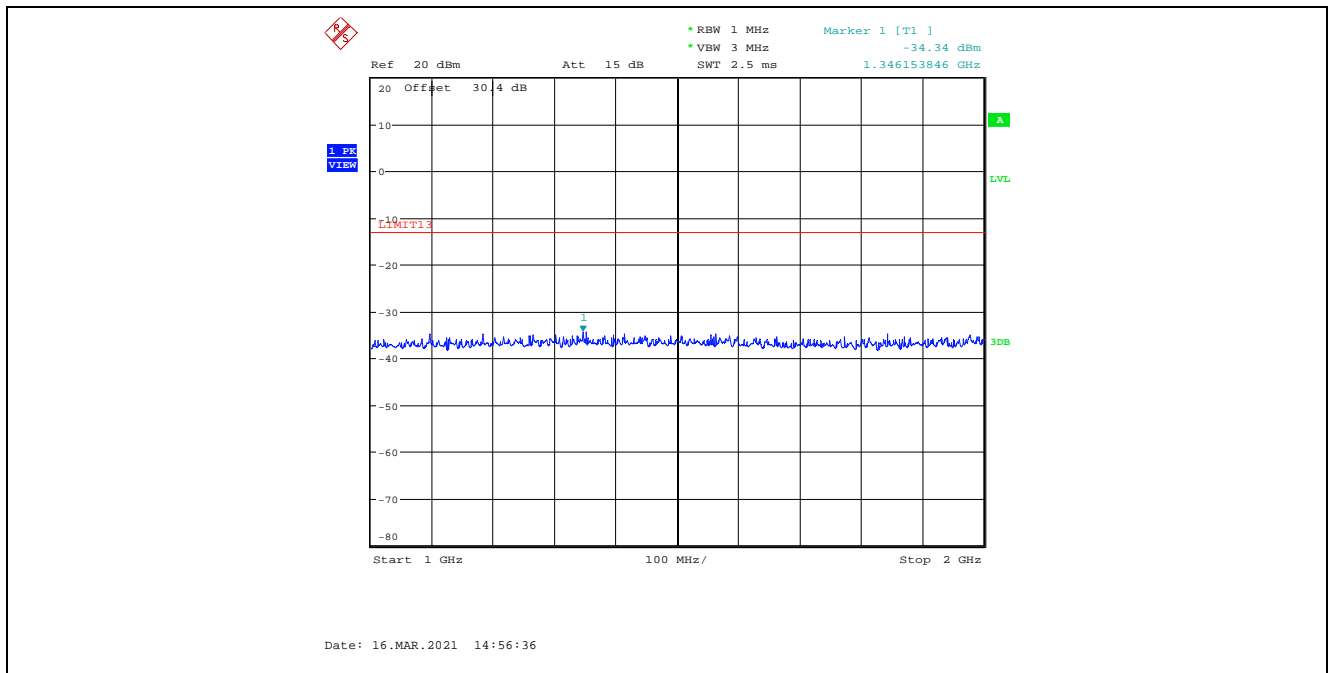
Plot 5.5.4.4. Transmitter Spurious Emissions at Antenna Terminal, CH 88, 157.425 MHz, High Power
30 MHz – 250 MHz



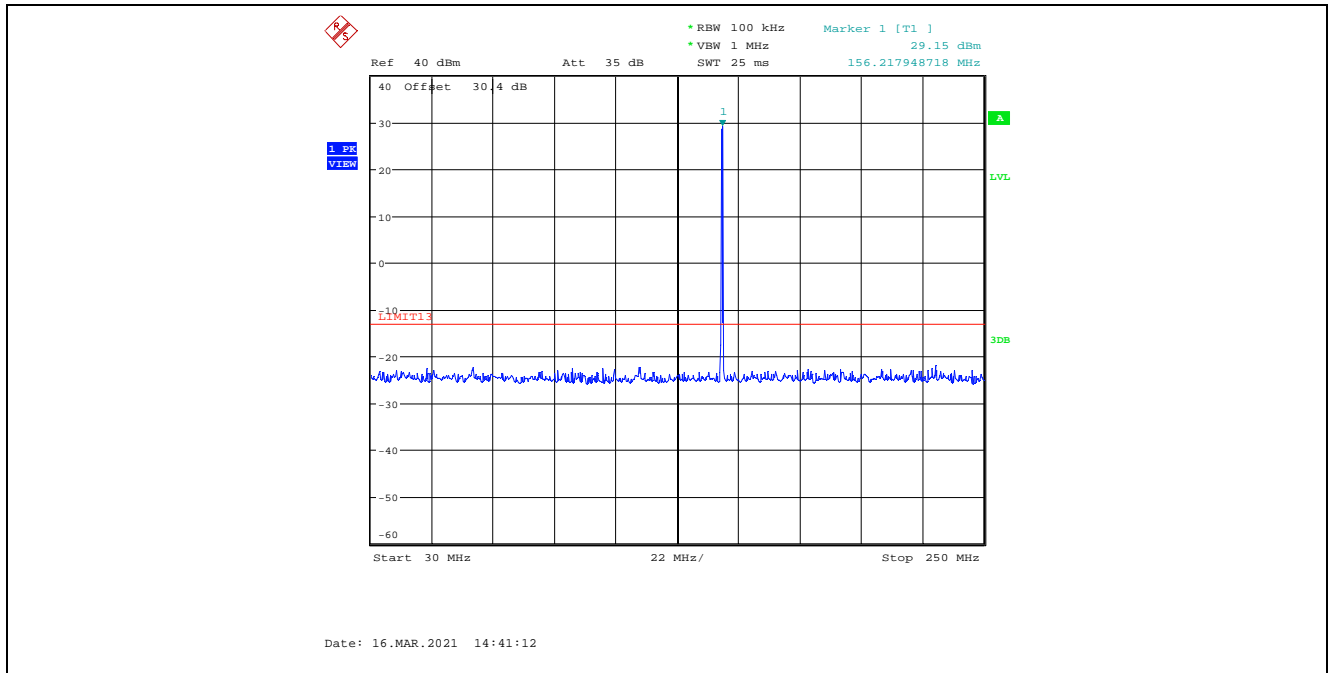
Plot 5.5.4.5. Transmitter Spurious Emissions at Antenna Terminal, CH 88, 157.425 MHz, High Power
250 MHz – 1 GHz



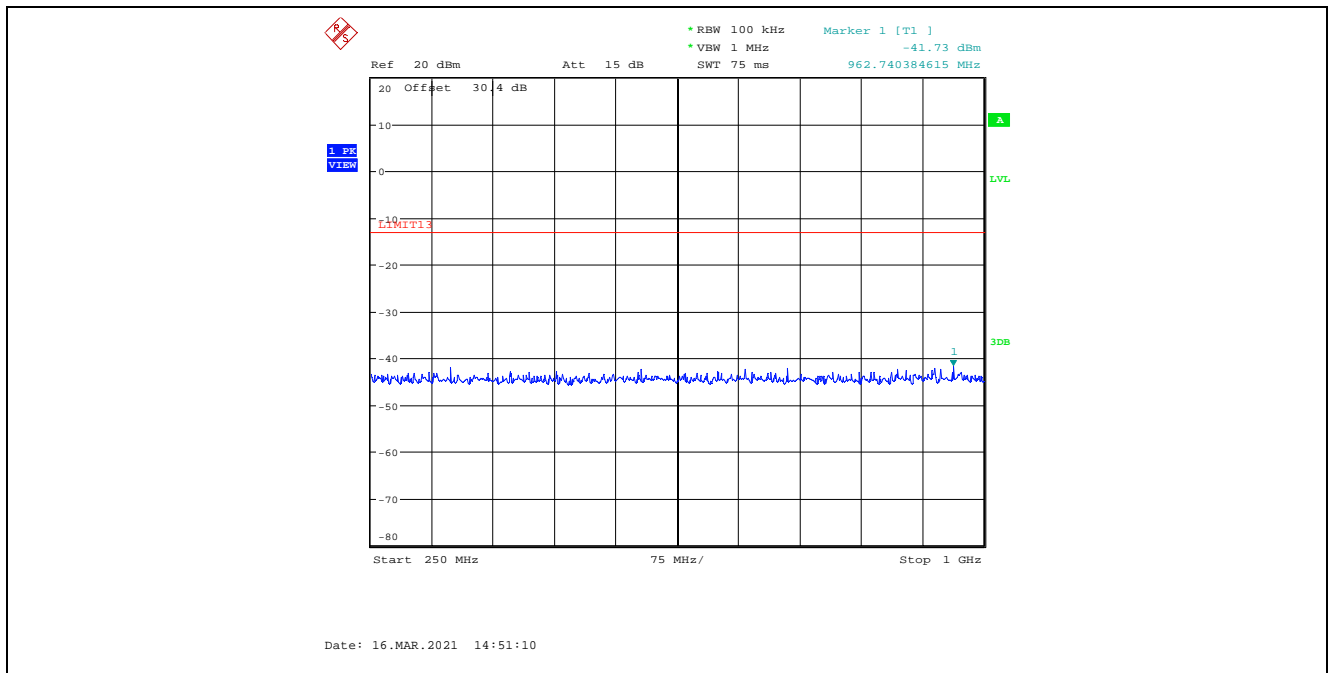
Plot 5.5.4.6. Transmitter Spurious Emissions at Antenna Terminal, CH 88, 157.425 MHz, High Power
1 GHz – 2 GHz



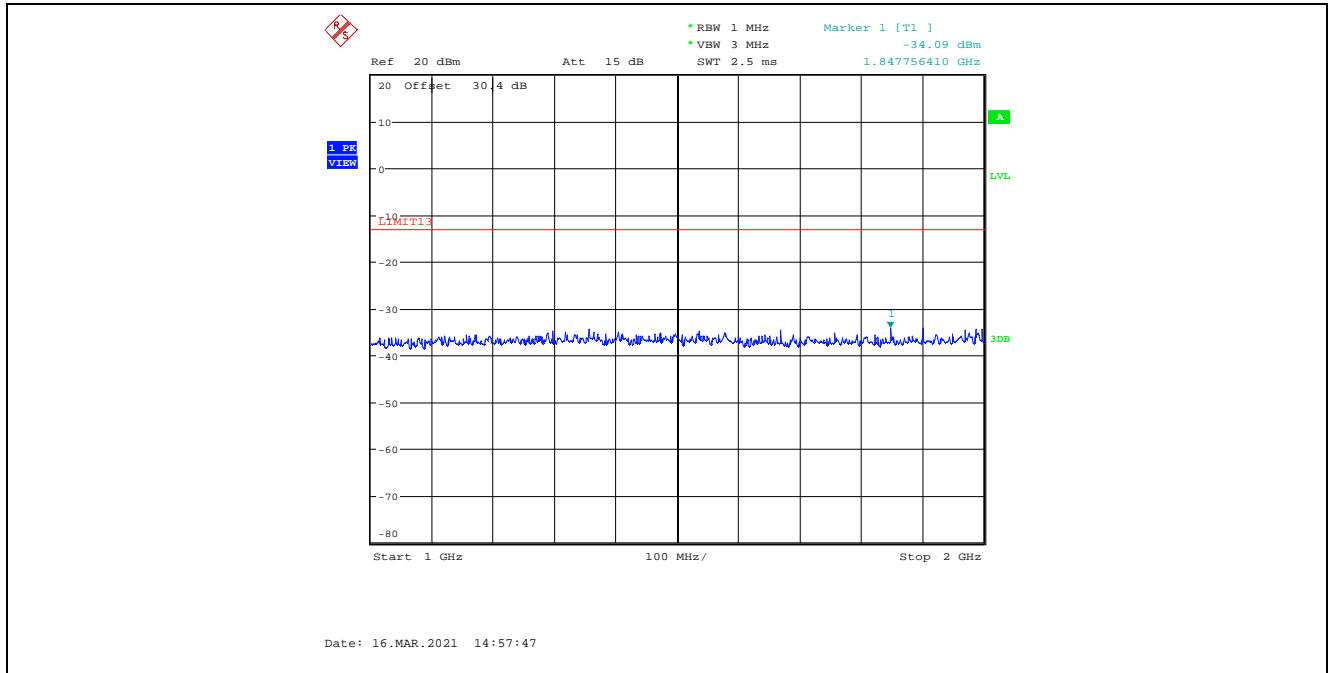
Plot 5.5.4.7. Transmitter Spurious Emissions at Antenna Terminal, CH 01A, 156.050 MHz, Low Power
30 MHz – 250 MHz



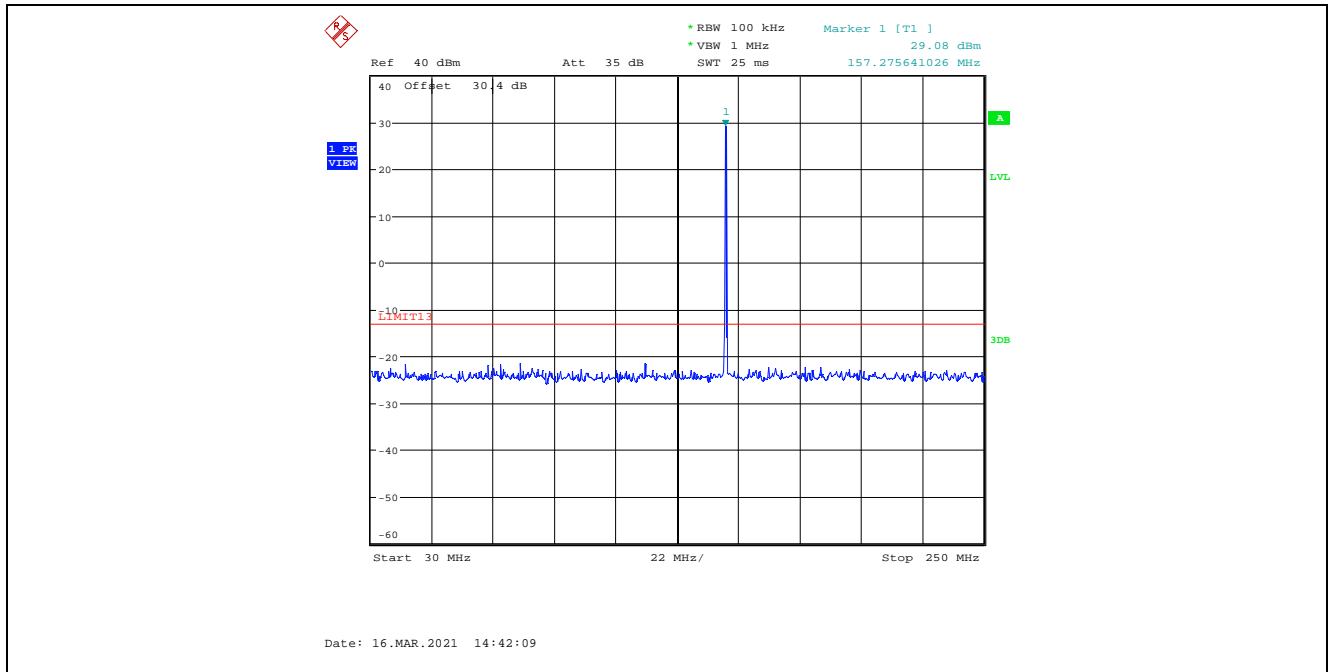
Plot 5.5.4.8. Transmitter Spurious Emissions at Antenna Terminal, CH 01A, 156.050 MHz, Low Power
250 MHz – 1 GHz



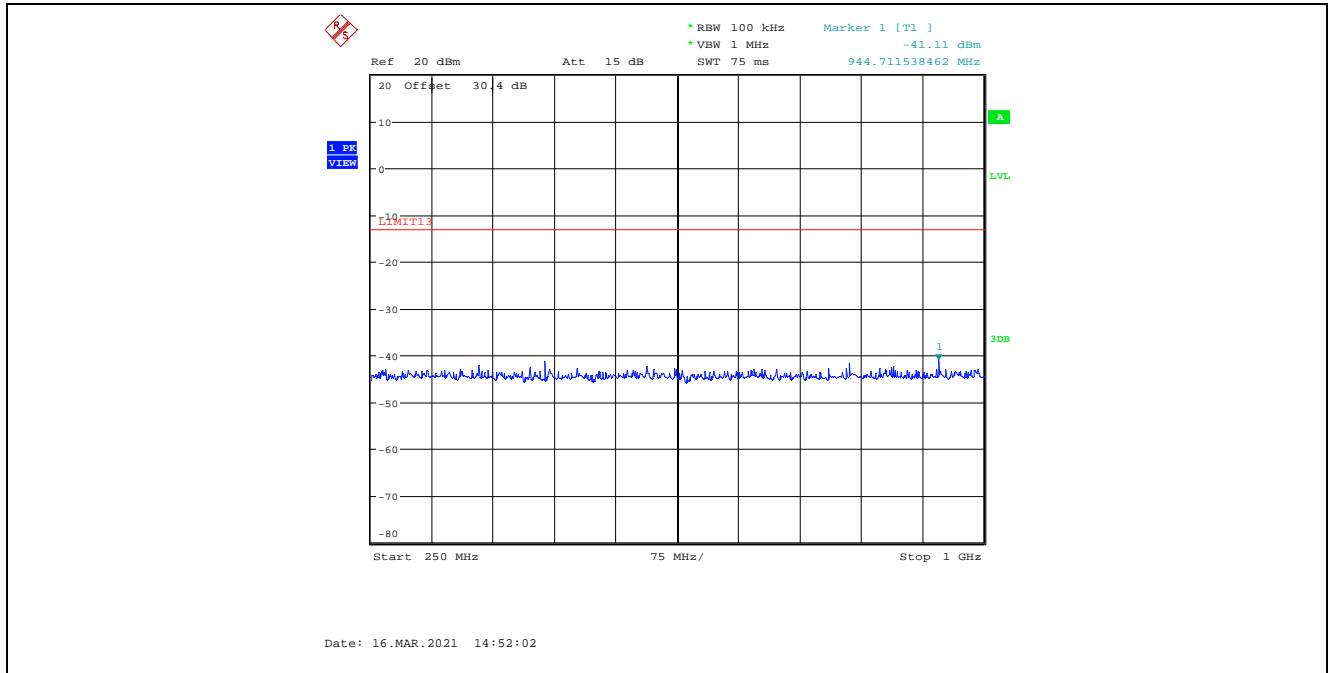
Plot 5.5.4.9. Transmitter Spurious Emissions at Antenna Terminal, CH 01A, 156.050 MHz, Low Power
1 GHz – 2 GHz



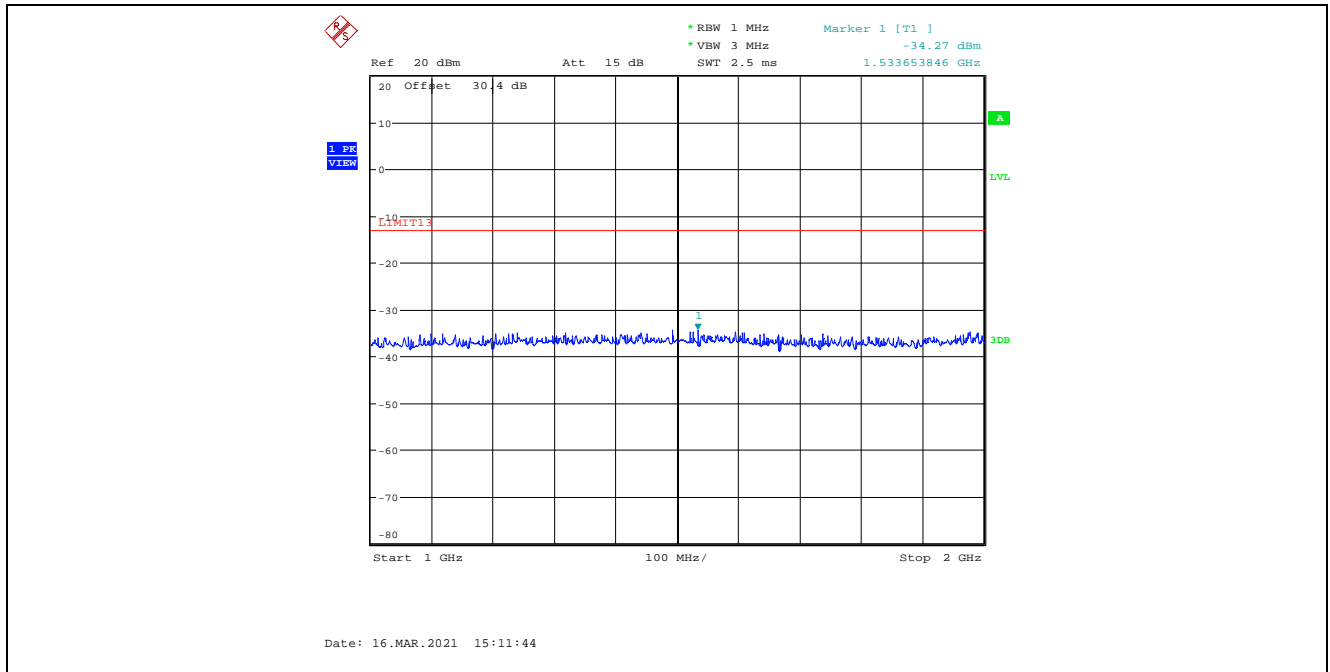
Plot 5.5.4.10. Transmitter Spurious Emissions at Antenna Terminal, CH 88, 157.425 MHz, Low Power
30 MHz – 250 MHz



Plot 5.5.4.11. Transmitter Spurious Emissions at Antenna Terminal, CH 88, 157.425 MHz, Low Power
250 MHz – 1 GHz



Plot 5.5.4.12. Transmitter Spurious Emissions at Antenna Terminal, CH 88, 157.425 MHz, Low Power
1 GHz – 2 GHz



5.6. TRANSMITTER SPURIOUS/HARMONIC RADIATED EMISSIONS [§§ 2.1053 & 80.211(f)(3)]

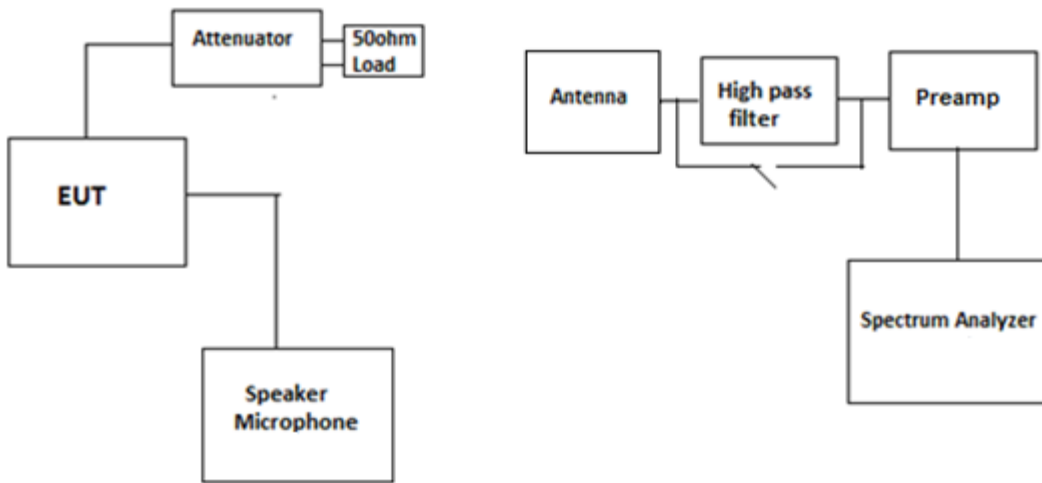
5.6.1. Limits

§80.211(f)(3) On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus $10\log_{10}$ (mean power in watts) 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.

Carrier Frequency:		156.050 MHz						
Power Setting:		High						
Limit:		-13 dBm						
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP/Avg)	Antenna Polarization (V/H)	Power from Signal Gen. (dBm)	Subs. Ant. Gain (dBi)	ERP/EIRP (dBm)	Limit (dBm)	Margin (dB)
Spurious emissions are more than 20 dB below the applicable limit.								

Carrier Frequency:		157.425 MHz						
Power Setting:		High						
Limit:		-13 dBm						
Frequency (MHz)	E-Field (dBµV/m)	EMI Detector (Peak/QP/Avg)	Antenna Polarization (V/H)	Power from Signal Gen. (dBm)	Subs. Ant. Gain (dBd/dBi)	ERP/EIRP (dBm)	Limit (dBm)	Margin (dB)
Spurious emissions are more than 20 dB below the applicable limit.								

5.7. FREQUENCY STABILITY [§§ 2.1055 & 80.209]

5.7.1. Limits

§80.209(a)(5)

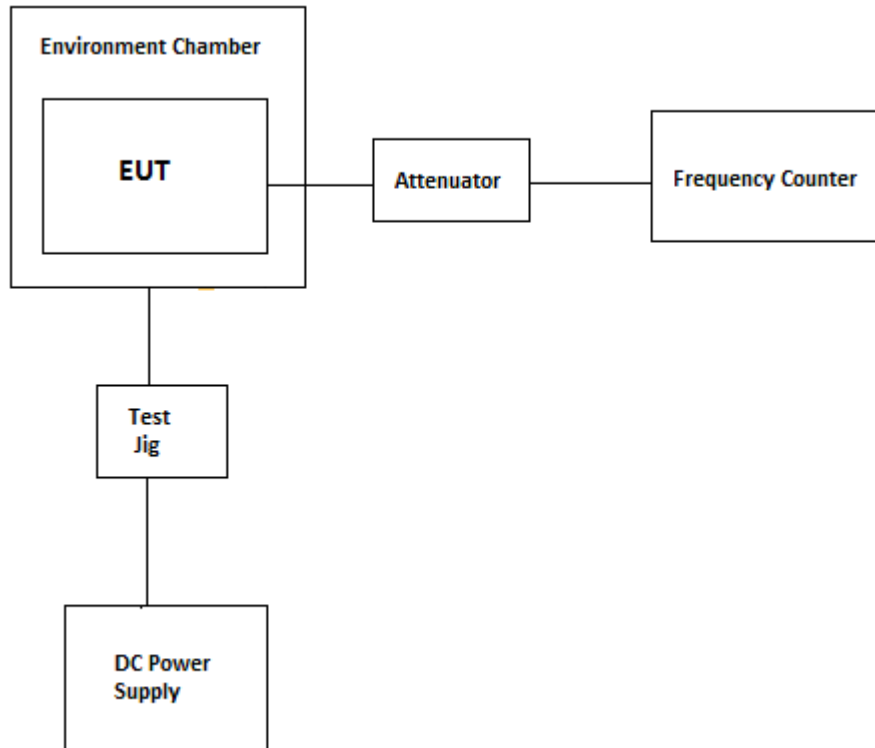
Frequency Band	Coast Stations		Ship Stations
	Below 3 W	Below 3 W	
156–162 MHz	10 ppm	¹ 5 ppm	² 10 ppm

¹ For transmitters operated at private coast stations with antenna heights less than 6 meters (20 feet) above ground and output power of 225 Watts or less the frequency tolerance is 10 parts in 106.
² For transmitters in the radiolocation and associated telecommand service operating on 154.585 MHz, 59.480 MHz, 160.725 MHz and 160.785 MHz the frequency tolerance is 15 parts in 106.

5.7.2. Method of Measurements

ANSI C63.26 Section 5.6.

5.7.3. Test Arrangement



5.7.4. Test Data

Center Frequency:	156.050 MHz		
Full Power Level:	5.65 W		
Frequency Tolerance Limit (Worst Case):	10 ppm or 1560.5 Hz		
Max. Frequency Tolerance Measured:	0.65 ppm or +101 Hz		
Input Voltage Rating:	7.4 VDC		
Ambient Temperature (°C)	Frequency Drift (Hz)		
	Supply Voltage (Nominal) 7.4 VDC	Supply Voltage (Battery End Point) 6.2 VDC	Supply Voltage (115% of 7.4 VDC) 8.51 VDC
-20	+66	--	--
-10	+88	--	--
0	+95	--	--
+10	+101	--	--
+20	+93	+88	+92
+30	+80	--	--
+40	+89	--	--
+50	+91	--	--
+60	+81	--	--

5.8. SUPPRESSION OF INTERFERENCE ABOARD SHIPS [§ 80.217]

5.8.1. Limits

§80.217 Suppression of interference aboard ships.

- (a) A voluntarily equipped ship station receiver must not cause harmful interference to any receiver required by statute or treaty.
- (b) The electromagnetic field from receivers required by statute or treaty must not exceed the following value at a distance over sea water of one nautical mile from the receiver:

Frequency of interfering emissions	Field intensity in microvolts per meter
Below 30 MHz	0.1
30 to 100 MHz	.3
100 to 300 MHz	1.0
Over 300 MHz	3.0

Or

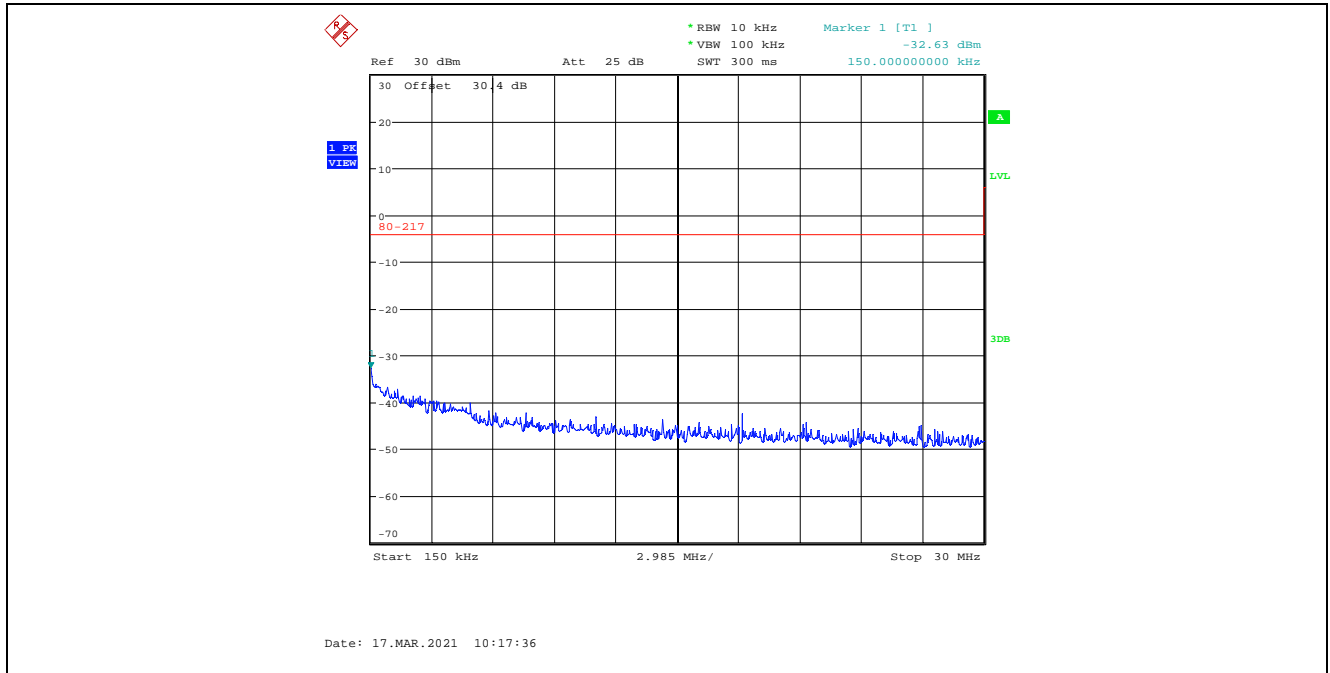
Deliver not more than the following amounts of power, to an artificial antenna having electrical characteristics equivalent to those of the average receiving antenna(s) use on shipboard:

Frequency of interfering emissions	Power to artificial antenna in microwatts
Below 30 MHz	400
30 to 100 MHz	4,000
100 to 300 MHz	40,000
Over 300 MHz	400,000

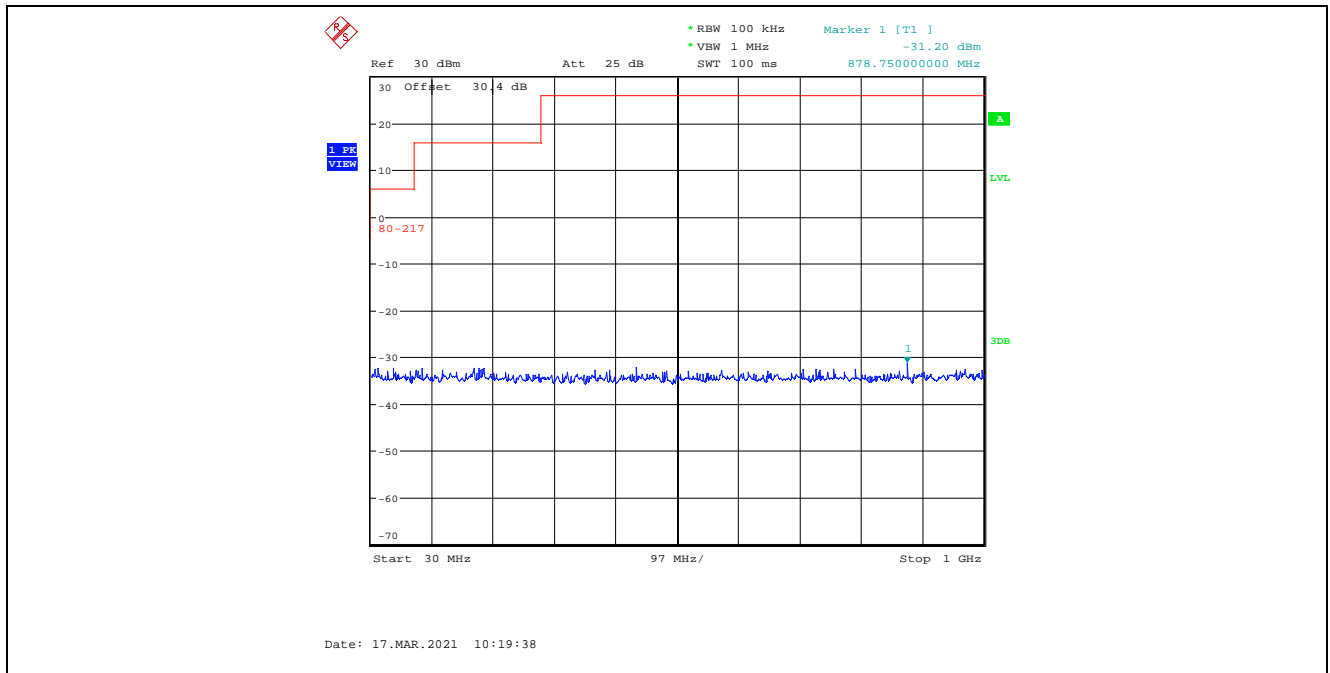
5.8.2. Method of Measurements

ANSI C63.4 Section 12

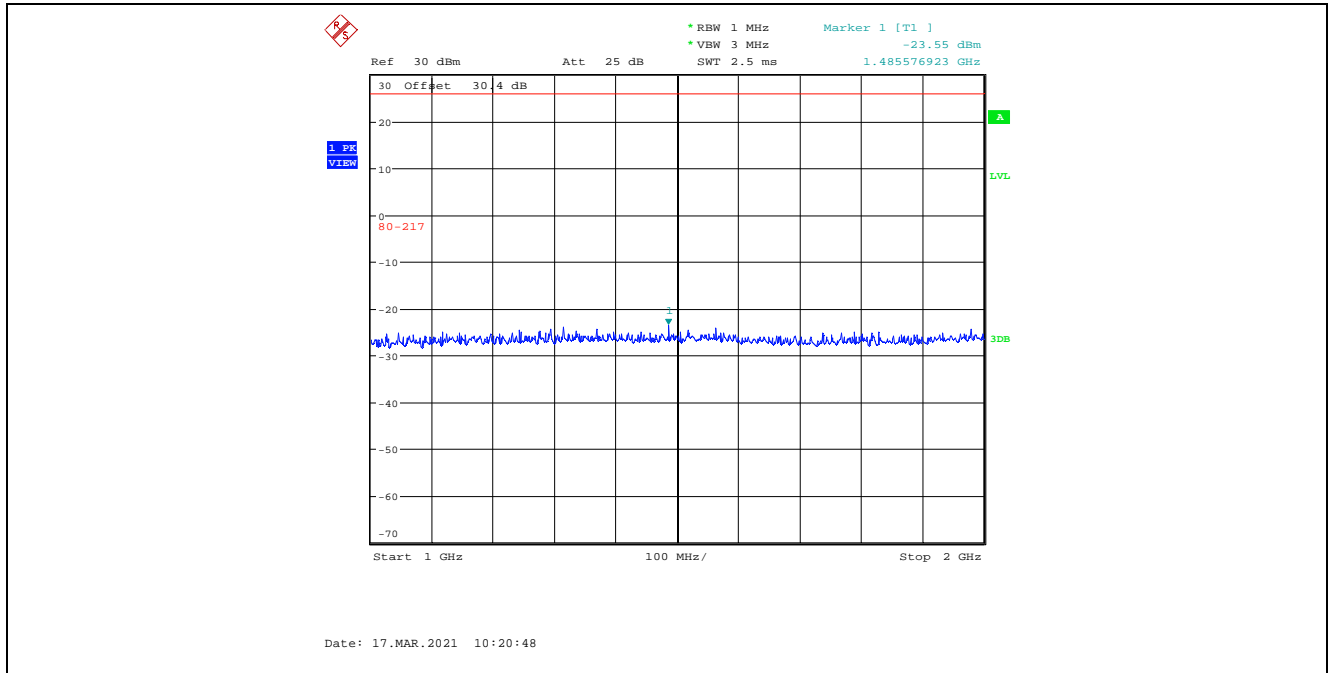
Plot 5.8.4.2. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH 01A, 156.050 MHz
150 kHz – 30 MHz



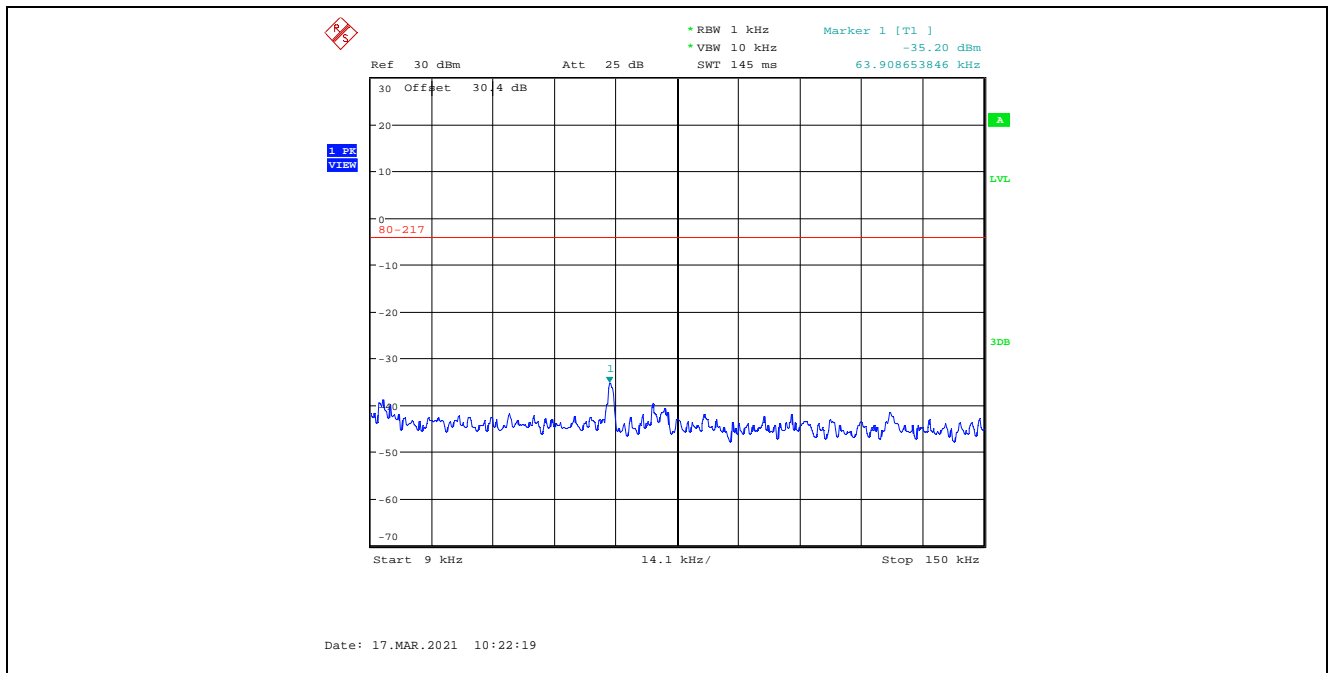
Plot 5.8.4.3. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH 01A, 156.050 MHz
30 MHz – 1 GHz



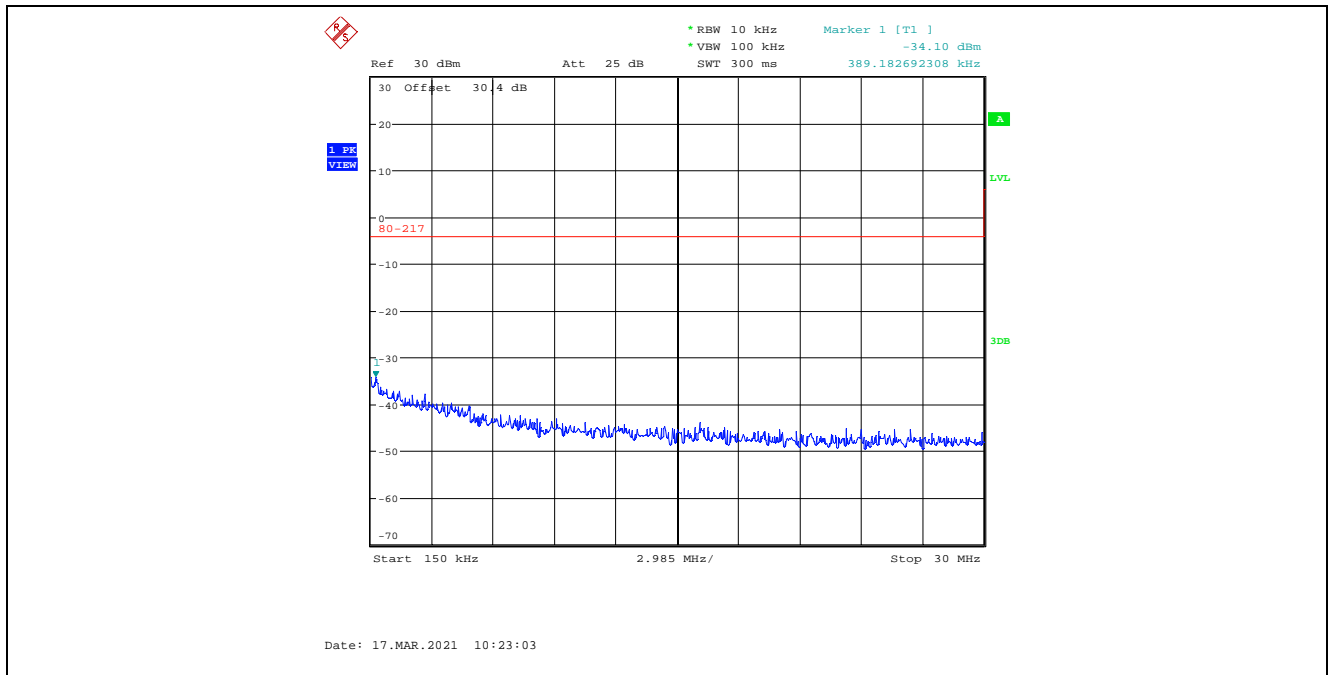
Plot 5.8.4.4. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH 01A, 156.050 MHz
1 GHz – 2 GHz



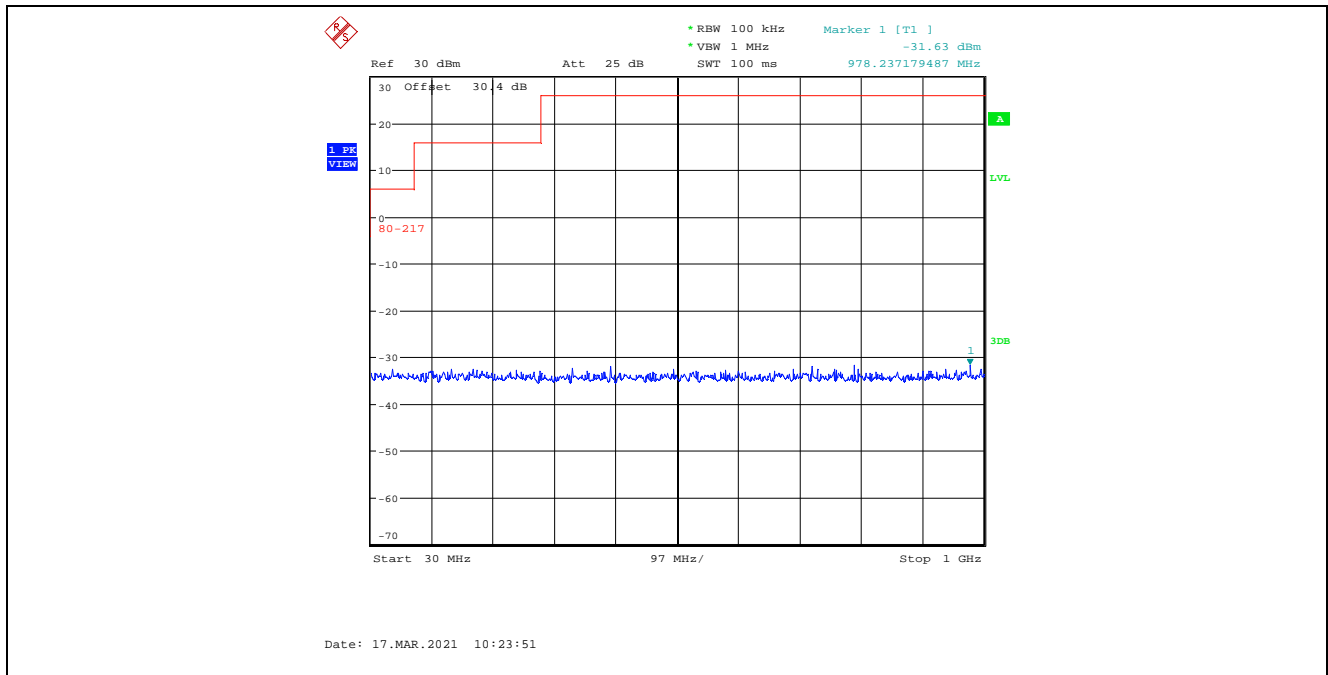
Plot 5.8.4.5. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH Wx 10, 163.275 MHz
9 kHz - 150 kHz



Plot 5.8.4.6. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH Wx 10, 163.275 MHz
150 kHz – 30 MHz



Plot 5.8.4.7. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH Wx 10, 163.275 MHz
30 MHz – 1 GHz



Plot 5.8.4.8. Suppression of Interference Aboard Ships, Rx Emissions at Antenna Terminal, CH Wx 10, 163.275 MHz
1 GHz – 2 GHz

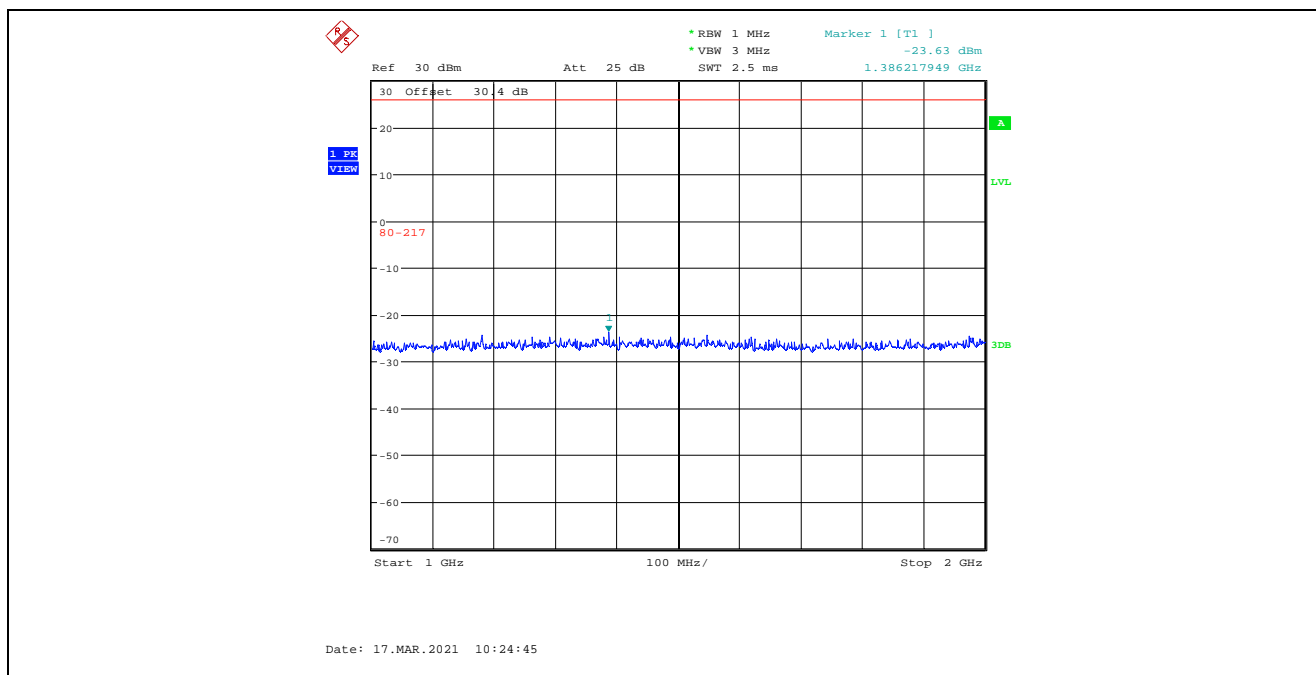


EXHIBIT 6. TEST EQUIPMENT LIST

Test Instruments	Manufacturer	Model No.	Serial No.	Frequency Range	Cal. Due Date
Power Meter	HP	436A	2709A27515	100 kHz-sensor dependent	17 Jul 2021
Power Sensor	HP	8482A	MY44175182	0.1 MHz - 4.2 GHz	08 Dec 2021
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	4142055	---	17 May 2021
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
Attenuator	Aeroflex\Weinschel	46-30-34	BR9127	DC – 18 GHz	See Note 1
Spectrum Analyzer	Rohde & Schwarz	FSU	100398	20 Hz - 26.5 GHz	23 Oct 2021
Hi-pass filter	Mini-Circuit	SHP-250	--	Cut off 250 MHz	See Note 1
Spectrum Analyzer	Rohde & Schwarz	ESU40	100037	20 Hz – 40 GHz	31 Mar 2021
Biconilog Antenna	EMCO	3142C	00034792	26 - 3000 MHz	16 May 2022
Log Periodic Antenna	ETS	93148	1101	200 – 2000 MHz	26 Apr 2021
Horn Antenna	ETS	3115	5061	1 - 18 GHz	10 Jun 2022
Horn Antenna	ETS	3117	00119425	1 - 18 GHz	25 Jul 2021
Preamplifier	Com-Power	PAM-118A	551016	500 MHz - 18 GHz	15 Mar 2022
Preamplifier	HP	8447F	2805A03287	0.1 - 1300 MHz	15 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	10 Jun 2021
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					

ULTRATECH GROUP OF LABS

3000 Bristol Circle, Oakville, Ontario, Canada L6H 6G4
Tel. #: 905-829-1570, Fax. #: 905-829-8050, Email: vic@ultratech-labs.com, Website: <http://www.ultratech-labs.com>

File #: 211COM539_FCC80
April 21, 2021

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	Expanded Uncertainty, K=2 for 95% Confidence Level
Conducted Power	± 0.62 dB
Occupied Bandwidth and Emission Mask	+0.20 Hz / +0.63 dB
Transmitter Spurious Conducted Emissions	+0.72 dB
Transmitter Spurious Radiated Emissions	+4.20 dB (30 MHz – 1 GHz)
	+2.70 dB (1 – 18 GHz)
Frequency Stability	± 1.20 Hz
Suppression of Interference aboard ships	+0.72 dB