FCC PART 80

TEST REPORT

For

SAMYUNG ENC Co., Ltd.

1123-17, Dongsam-3-Dong,

Youngdo-Gu, Busan, South Korea

FCC ID: RN6SRG-150DN

Report Type: Original Report	**Product Type:** MF/HF GMDSS Radio Equipment
Prepared By:	Zhao Zhao, Test Engineer
Report Number:	R1909275
Report Date:	2021-03-15
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ACCREDITED
CERTIFICATE #3297.02

TABLE OF CONTENTS

DOCUMENT REVISION HISTORY

Revision Number	Report Number	Description of Revision	Date of Revision
0	R1909275	Original Report	2021-03-15

1 General Description

1.1 Product Description for Equipment Under Test (EUT)

This test report was prepared on behalf of *SAMYUNG ENC Co., Ltd*, and their product model: *SRG-150DN,* FCC ID: RN6SRG-150DN; or the "EUT" as referred to in this report. The EUT is a MF/HF-single side band ship station Transceiver operate in 1.605-27.5 MHz with DSC functionality in the frequency range of 2.1875-16.8045 MHz.

1.2 Mechanical Description of EUT

The SRG-150DN measures approximately 32.7 cm (L) x 32.4 cm (W) x 17.0 cm (H) and weighs approximately 8.1 kg.

The data gathered are from the typical production sample provided by SamYung ENC Co., LTD with serial number: R1909275-1. Serial numbers were provided by BACL.

1.3 Objective

This type approval report is prepared on behalf of *SamYung ENC Co., LTD in* accordance with Part 2, Subpart J and Part 80 of the Federal Communication Commissions' rules.

The objective is to determine compliance with FCC rules for RF output power, modulation characteristic, occupied bandwidth, spurious emission at antenna terminal, field strength of spurious radiation, frequency stability, and conducted and radiated margin.

1.4 Test Methodology

All tests and measurements indicated in this document were performed in accordance with the Code of Federal Regulations Title 47 Part 2, Sub-part J as well as the following parts:

Part 80 – Stations in the Maritime Services

Applicable Standards: TIA-603-E, ANSI C63.26-2015.

All radiated and conducted emissions measurement was performed at Bay Area Compliance Laboratories, Corp.

1.5 Measurement Uncertainty

All measurements involve certain levels of uncertainties, especially in the field of EMC. The factors contributing to uncertainties are spectrum analyzer, cable loss, antenna factor calibration, antenna directivity, antenna factor variation with height, antenna phase center variation, antenna factor frequency interpolation, measurement distance variation, site imperfections, mismatch (average), and system repeatability.

Parameter	Measurement uncertainty
Occupied Channel Bandwidth	±5 %
RF output power, conducted	±0.57 dB
Power Spectral Density, conducted	±1.48dB
Unwanted Emissions, conducted	±1.57dB
All emissions, radiated	±4.0 dB
AC power line Conducted Emission	±2.0 dB
Temperature	±2 ° C
Humidity	±5 %
DC and low frequency voltages	±1.0 %
Time	±2 %
Duty Cycle	±3 %

1.6 Test Facility Registrations

BACLs test facilities that are used to perform Radiated and Conducted Emissions tests are currently recognized by the Federal Communications Commission as Accredited with NIST Designation Number US1129.

BACL's test facilities that are used to perform Radiated and Conducted Emissions tests are currently registered with Industry Canada under Registration Numbers: 3062A-1, 3062A-2, and 3062A-3.

BACL is a Chinese Taipei Bureau of Standards Metrology and Inspection (BSMI) validated Conformity Assessment Body (CAB), under Appendix B, Phase I Procedures of the APEC Mutual Recognition Arrangement (MRA). BACL's BSMI Lab Code Number is: SL2-IN-E-1002R

BACL's test facilities that are used to perform AC Line Conducted Emissions, Telecommunications Line Conducted Emissions, Radiated Emissions from 30 MHz to 1 GHz, and Radiated Emissions from 1 GHz to 6 GHz are currently recognized as Accredited in accordance with the Voluntary Control Council for Interference [VCCI] Article 15 procedures under Registration Number A-0027.

1.7 Test Facility Accreditations

Bay Area Compliance Laboratories Corp. (BACL) is:

A- ***An independent, 3rd-Party, Commercial Test Laboratory accredited to ISO/IEC 17025:2005 by A2LA (Test Laboratory Accreditation Certificate Number 3297.02)*****,** in the fields of: Electromagnetic Compatibility and Telecommunications. Unless noted by an Asterisk (*) in the Compliance Matrix (See Section 3 of this Test Report), BACL's ISO/IEC 17025:2005 Scope of Accreditation includes all of the Test Method Standards and/or the Product Family Standards detailed in this Test Report..

BACL's ISO/IEC 17025:2005 Scope of Accreditation includes a comprehensive suite of EMC Emissions, EMC Immunity, Radio, RF Exposure, Safety and wireline Telecommunications test methods applicable to a wide range of product categories. These product categories include Central Office Telecommunications Equipment [including NEBS - Network Equipment Building Systems], Unlicensed and Licensed Wireless and RF devices,

Information Technology Equipment (ITE); Telecommunications Terminal Equipment (TTE); Medical Electrical Equipment; Industrial, Scientific and Medical Test Equipment; Professional Audio and Video Equipment; Industrial and Scientific Instruments and Laboratory Apparatus; Cable Distribution Systems, and Energy Efficient Lighting.

B- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.03)*** to certify

- For the USA (Federal Communications Commission):
  - 1- All Unlicensed radio frequency devices within FCC Scopes A1, A2, A3, and A4;
  - 2- All Licensed radio frequency devices within FCC Scopes B1, B2, B3, and B4;
  - 3- All Telephone Terminal Equipment within FCC Scope C.
- For the Canada (Industry Canada):
  - 1 All Scope 1-Licence-Exempt Radio Frequency Devices;
  - 2 All Scope 2-Licensed Personal Mobile Radio Services;
  - 3 All Scope 3-Licensed General Mobile & Fixed Radio Services;
  - 4 All Scope 4-Licensed Maritime & Aviation Radio Services;
  - 5 All Scope 5-Licensed Fixed Microwave Radio Services
  - 6 All Broadcasting Technical Standards (BETS) in the Category I Equipment Standards List.
- For Singapore (Info-Communications Development Authority (IDA)):
  - 1 All Line Terminal Equipment: All Technical Specifications for Line Terminal Equipment – Table 1 of IDA MRA Recognition Scheme: 2011, Annex 2
  - 2. All Radio-Communication Equipment: All Technical Specifications for Radio-Communication Equipment – Table 2 of IDA MRA Recognition Scheme: 2011, Annex 2
- For the Hong Kong Special Administrative Region:
  - 1 All Radio Equipment, per KHCA 10XX-series Specifications;
  - 2 All GMDSS Marine Radio Equipment, per HKCA 12XX-series Specifications;
  - 3 All Fixed Network Equipment, per HKCA 20XX-series Specifications.
- For Japan:
  - 1 MIC Telecommunication Business Law (Terminal Equipment):
    - All Scope A1 - Terminal Equipment for the Purpose of Calls;
    - All Scope A2 - Other Terminal Equipment
  - 2 Radio Law (Radio Equipment):
    - All Scope B1 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 1 of the Radio Law
    - All Scope B2 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 2 of the Radio Law
    - All Scope B3 - Specified Radio Equipment specified in Article 38-2-2, paragraph 1, item 3 of the Radio Law

C- ***A Product Certification Body accredited to ISO/IEC 17065:2012 by A2LA (Product Certification Body Accreditation Certificate Number 3297.01)*** to certify Products to USA's Environmental Protection Agency (EPA) ENERGY STAR Product Specifications for:

1 Electronics and Office Equipment:
- for Telephony (ver. 3.0)
- for Audio/Video (ver. 3.0)
- for Battery Charging Systems (ver. 1.1)
- for Set-top Boxes & Cable Boxes (ver. 4.1)
- for Televisions (ver. 6.1)
- for Computers (ver. 6.0)
- for Displays (ver. 6.0)
- for Imaging Equipment (ver. 2.0)
- for Computer Servers (ver. 2.0)

2 Commercial Food Service Equipment

- for Commercial Dishwashers (ver. 2.0)
- for Commercial Ice Machines (ver. 2.0)
- for Commercial Ovens (ver. 2.1)
- for Commercial Refrigerators and Freezers

3 Lighting Products
- For Decorative Light Strings (ver. 1.5)
- For Luminaires (including sub-components) and Lamps (ver. 1.2)
- For Compact Fluorescent Lamps (CFLs) (ver. 4.3)
- For Integral LED Lamps (ver. 1.4)

4 Heating, Ventilation, and AC Products
- for Residential Ceiling Fans (ver. 3.0)
- for Residential Ventilating Fans (ver. 3.2)

5 Other
- For Water Coolers (ver. 3.0)

D- ***A NIST Designated Phase-I and Phase-II Conformity Assessment Body (CAB) for the following economies and regulatory authorities under the terms of the stated MRAs/Treaties:***

- Australia: ACMA (Australian Communication and Media Authority) – APEC Tel MRA -Phase I;
- Canada: (Innovation, Science and Economic development Canada - ISEDC) Foreign Certification Body – FCB – APEC Tel MRA -Phase I & Phase II;
- Chinese Taipei (Republic of China – Taiwan):
  - BSMI (Bureau of Standards, Metrology and Inspection) APEC Tel MRA -Phase I;
  - NCC (National Communications Commission) APEC Tel MRA -Phase I;
- European Union:
  - EMC Directive 2014/30/EU US-EU EMC & Telecom MRA CAB (NB)
  - Radio Equipment (RE) Directive 2014/53/EU US-EU EMC & Telecom MRA CAB (NB)
  - Low Voltage Directive (LVD) 2014/35/EU
- Hong Kong Special Administrative Region: (Office of the Telecommunications Authority – OFTA) APEC Tel MRA -Phase I & Phase II
- Israel – US-Israel MRA Phase I
- Republic of Korea (Ministry of Communications - Radio Research Laboratory) APEC Tel MRA -Phase I
- Singapore: (Infocomm Media Development Authority - IMDA) APEC Tel MRA -Phase I & Phase II;
- Japan: VCCI - Voluntary Control Council for Interference US-Japan Telecom Treaty VCCI Side Letter-
- USA:
  - ENERGY STAR Recognized Test Laboratory – US EPA
  - Telecommunications Certification Body (TCB) – US FCC;
  - Nationally Recognized Test Laboratory (NRTL) – US OSHA
- Vietnam: APEC Tel MRA -Phase I;

2 System Test Configuration

2.1 Justification

The EUT was configured for testing according to ANSI C63.26-2013 and TIA-603-E.

2.2 EUT Exercise Software

The EUT has built-in firmware which is compliant with the standard requirements being tested against. The following channels and power ratings were provided for testing.

SSB Mode (J3E)

Channel	Carrier Frequency (kHz)	Power Level	Rated Power (Watts)
Low	1605.00	High	150
		Middle	100
		Low	50
Middle	8291.00	High	150
		Middle	100
		Low	50
High	27500.00	High	150
		Middle	100
		Low	50

DSC (FSK) Mode (F1B)

Channel	Carrier Frequency (kHz)	Rated Power (Watts)
Low	2187.5	100
Middle	8414.5	100
High	16804.5	100

2.3 Equipment Modifications

None.

2.4 Local Support Equipment

Manufacturer	Description	Model	Serial Number
Sorensen	DC Power Supply	SGA60X167E-1DAA	0846A00483
CAT	DC Batteries	153-5710	-
MCL	10 dB Attenuator	BW-S10W5+	-
Picosecono	DC Block	5500A-110	-

2.5 Remote Support Equipment

Manufacturer	Description	Model	Serial Number
API Weinschel, Inc.	Attenuator 40 dB	53-40-43	TY490
SamYung	Microphone	SM-1150	-

2.6 Interface Ports and Cabling

None

3 Summary of Test Results

Results reported relate only to the product tested.

FCC Rules	Description of Test	Result
§2.1046, 80.215	Output Power, Emission Limitations, Transmitter Power	Compliant
§2.1047, §80.207, §80.213	Modulation Characteristics, Classes of Emission, Modulation Requirements	Compliant
§2.1049, §80.211, §80.205	Occupied Bandwidth, Bandwidths (Authorized Bandwidth)	Compliant
§2.1051; §80.217 (b)	Spurious Emission at Antenna Terminals, Suppression of Interference	Compliant
§2.1053, §80.217 (b)	Field Strength of Spurious Emission, Suppression of Interference	Compliant
§2.1055, §80.209	Frequency Stability, Transmitter Frequency Tolerance	Compliant
§2.1091, §80.227	Radiofrequency radiation exposure evaluation: mobile devices, Special requirements for protection from RF radiation	Compliant
§80.221	Special requirements for automatically generating the radiotelephone alarm signal	Compliant
§80.225	Requirements for selective calling equipment	Compliant
§80.229	Special requirements for automatic link establishment (ALE)	N/A*

*Note: The automatic link establishment (ALE) function is not supported.

4 FCC §2.1046 & §80.215 - OUTPUT POWER, EMISSION LIMITATIONS, TRANSMITTER POWER

4.1 Applicable Standards

§2.1046 (b)

(b) For single sideband, independent sideband, and single channel, controlled carrier radiotelephone transmitters the procedure specified in paragraph (a) of this section shall be employed and, in addition, the transmitter shall be modulated during the test as follows. In all tests, the input level of the modulating signal shall be such as to develop rated peak envelope power or carrier power, as appropriate, for the transmitter.

§80.215 (d)

(d) *Ship station frequencies below 27500 kHz.* The maximum power must not exceed the values listed below:

(2) Radiotelephony:
- All ships—Great Lakes and Inland Waters—150W

(3) Digital selective calling:
- All ships 415-526.5 kHz—400 W
- All ships 1605-4000 kHz—400 W
- All ships 4000-27500 kHz—1.5 kW

4.2 Test Procedure

The Transmitter (EUT) was connected to a resistive load coaxial attenuator of normal load impedance and modulated output power was measured by means of on Spectrum Analyzer.

4.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rhode & Schwarz	Signal Analyzer	FSQ26	200749	2019-11-07	2 years
Keysight Technologies	Functional Generator	33522B	MY59000619	2020-08-04	1 year
API Weinschel, Inc	Attenuator 40 dB	53-40-43	TY490	Each Time	Each Time
-	RF Cable	-	-	Each Time	Each Time

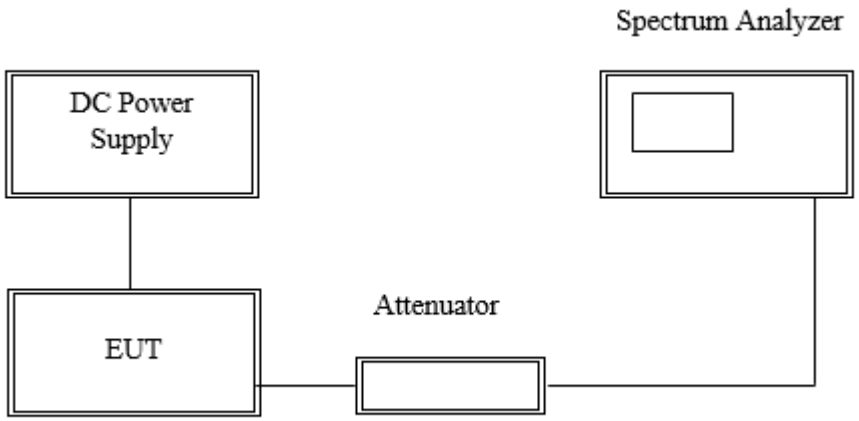
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

4.4 Test Environmental Conditions

Temperature:	23 °C
Relative Humidity:	34-44 %
ATM Pressure:	101.3-102.0 kPa

** The testing was performed by Zhao Zhao on 2020-11-16 and on 2021-02-02 at RF site.*

4.5 Test Setup Diagram



4.6 Test Results

SSB Mode (J3E)

Carrier Frequency (kHz)	Power Level	Transmit Output Power		Limit (Watts)
		(dBm)	(Watts)	
1605.00	High	50.95	124.45	150
	Middle	49.43	87.70	150
	Low	46.17	41.40	150
8291.00	High	51.14	130.02	150
	Middle	49.57	90.57	150
	Low	46.38	43.45	150
27500.00	High	51.35	136.46	150
	Middle	49.44	87.90	150
	Low	46.55	45.19	150

DSC Mode (F1B)

Carrier Frequency (kHz)	Transmit Output Power		Limit (Watts)
	(dBm)	(Watts)	
2187.5	50.31	107.40	400
8414.5	50.24	105.68	1500
16804.5	50.57	114.02	1500

5 FCC §2.1047, §80.207 & §80.213 - MODULATION CHARACTERISTICS, CLASSES OF EMISSION, MODULATION REQUIREMENTS

5.1 Applicable Standards

CFR47 § 2.1047(a) (c)

(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.

(c) *Single sideband and independent sideband radiotelephone transmitters which employ a device or circuit to limit peak envelope power.* A curve showing the peak envelope power output versus the modulation input voltage shall be supplied. The modulating signals shall be the same in frequency as specified in paragraph (c) of §2.1049 for the occupied bandwidth tests.

§80.207 (d)

§80.213 (a) (3)

(a) Transmitters must meet the following modulation requirements:

(3) In single sideband operation the upper sideband must be transmitted. Single sideband transmitters must automatically limit the peak envelope power to their authorized operating power and meet the requirements in §80.207(c).

5.2 Test Procedure

Audio Frequency Response:

The audio frequency of the test signal was varied from 100Hz to 5000Hz with the level of the audio frequency held at constant. Record the deviation level is recorded.

Peak Envelope Power vs Modulation Input voltage:

The transmitter is modulated in J3E mode with 400Hz and 1800 Hz. The output power relative to the rated Peak Envelope Power was measured using spectrum analyzer.

5.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rhode & Schwarz	Signal Analyzer	FSQ26	200749	2019-11-07	2 years
Keysight Technologies	Functional Generator	33522B	MY59000619	2020-08-04	1 year
API Weinschel, Inc	Attenuator 40 dB	53-40-43	TY490	Each Time	Each Time
-	RF Cable	-	-	Each Time	Each Time

Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

5.4 Test Environmental Conditions

Temperature:	23 ºC
Relative Humidity:	34 %
ATM Pressure:	101.3 kPa

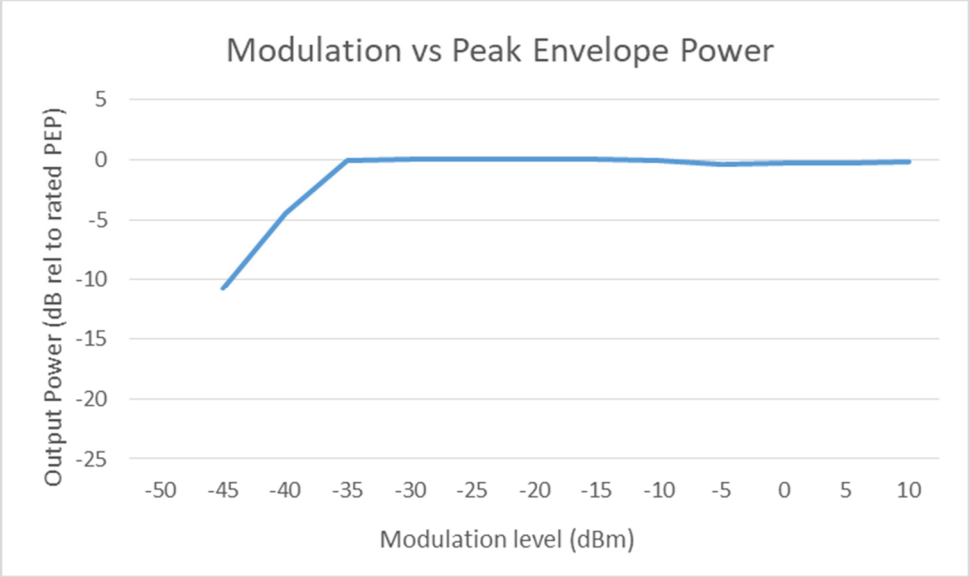
The testing was performed by Zhao Zhao on 2020-11-16 at RF Site.

5.5 Test Results

SSB Mode (J3E)

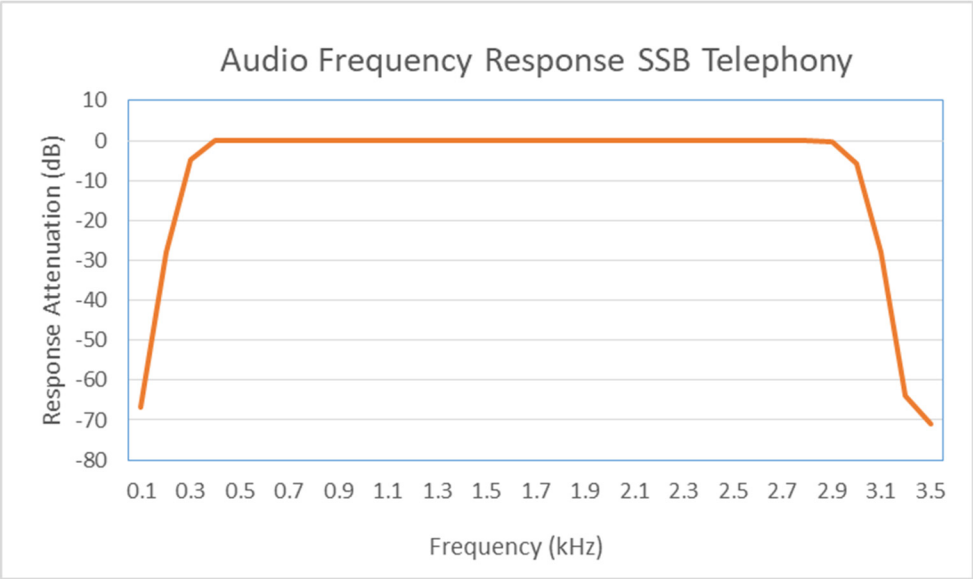
Modulation vs Peak Envelope Power (PEP)

Test Frequency: Middle Channel @ 8.291 MHz



Audio Frequency Response (Single Sideband Telephony)

Test Frequency: Middle Channel @ 8.291 MHz



6 FCC §2.1049, §80.211& §80.205(d) - OCCUPIED BANDWIDTH, EMIISSION LIMITATIONS, AUTHORIZED BANDWIDTH

6.1 Applicable Standards

CFR 47 § 2.1049 (c) (4).

(c) Radiotelephone transmitters equipped with a device to limit modulation or peak envelope power shall be modulated as follows. For single sideband and independent sideband transmitters, the input level of the modulating signal shall be 10 dB greater than that necessary to produce rated peak envelope power.

(2) Single sideband transmitters in A3A or A3J emission modes—when modulated by two tones at frequencies of 400 Hz and 1800 Hz (for 3.0 kHz authorized bandwidth), or 500 Hz and 2100 Hz (for 3.5 kHz authorized bandwidth), or 500 Hz and 2400 Hz (for 4.0 kHz authorized bandwidth), applied simultaneously. The input levels of the tones shall be so adjusted that the two principal frequency components of the radio frequency signal produced are equal in magnitude.

(3) Single sideband transmitters in the A3H emission mode—when modulated by one tone at a frequency of 1500 Hz (for 3.0 kHz authorized bandwidth), or 1700 Hz (for 3.5 kHz authorized bandwidth), or 1900 Hz (for 4.0 kHz authorized bandwidth), the level of which is adjusted to produce a radio frequency signal component equal in magnitude to the magnitude of the carrier in this mode.

(4) As an alternative to paragraphs (c) (2) and (3) of this section, other tones besides those specified may be used as modulating frequencies, upon a sufficient showing of need. However, any tones so chosen must not be harmonically related, the third and fifth order intermodulation products which occur must fall within the −25 dB step of the emission bandwidth limitation curve, the seventh and ninth order products must fall within the −35 dB step of the referenced curve and the eleventh and all higher order products must fall beyond the −35 dB step of the referenced curve.

§80.211 (a)

(a) The mean power when using emissions H3E, J3E and R3E:

(1) On any frequency removed from the assigned frequency by more than 50 percent up to and including 150 percent of the authorized bandwidth:

at least 25 dB for transmitters installed before February 1, 1992,

at least 28 dB for transmitters installed on or after February 1, 1992;

(2) On any frequency removed from the assigned frequency by more than 150 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.

(f) The mean power when using emissions other than those in paragraphs (a), (b), (c) and (d) of this section:

(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 10log10 (mean power in watts) dB.

§ 80.205

Bandwidths:

Class of Emission	Emission Designator	Authorized Bandwidth (kHz)
J3E	2K80J3E	3.0
F1B	300HF1B	0.5

6.2 Test Procedure

The RF output of the transmitter was connected to the simulator and the spectrum analyzer through sufficient attenuation. The EUT is modulated in J3E mode with 400Hz and 1800 Hz tones with a level 10dB greater than that of necessary to produce rated peak envelope power.

6.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rhode & Schwarz	Signal Analyzer	FSQ26	200749	2019-11-07	2 years
Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2019-08-06	18 Months
Keysight Technologies	Functional Generator	33522B	MY59000619	2020-08-04	1 year
API Weinschel, Inc.	Attenuator 40 dB	53-40-43	TY490	Each Time	Each Time
-	RF Cable	-	-	Each Time	Each Time

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

6.4 Test Environmental Conditions

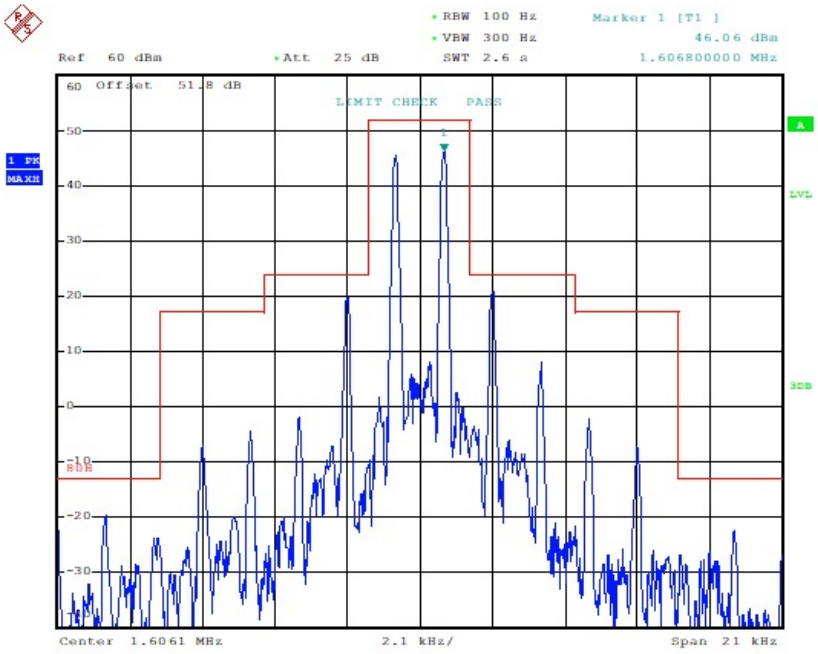
Temperature:	23 ºC
Relative Humidity:	34-46 %
ATM Pressure:	101.3 -102.1 kPa

The testing was performed by Zhao Zhao on 2020-11-16 and on 2021-02-02 at RF Site.

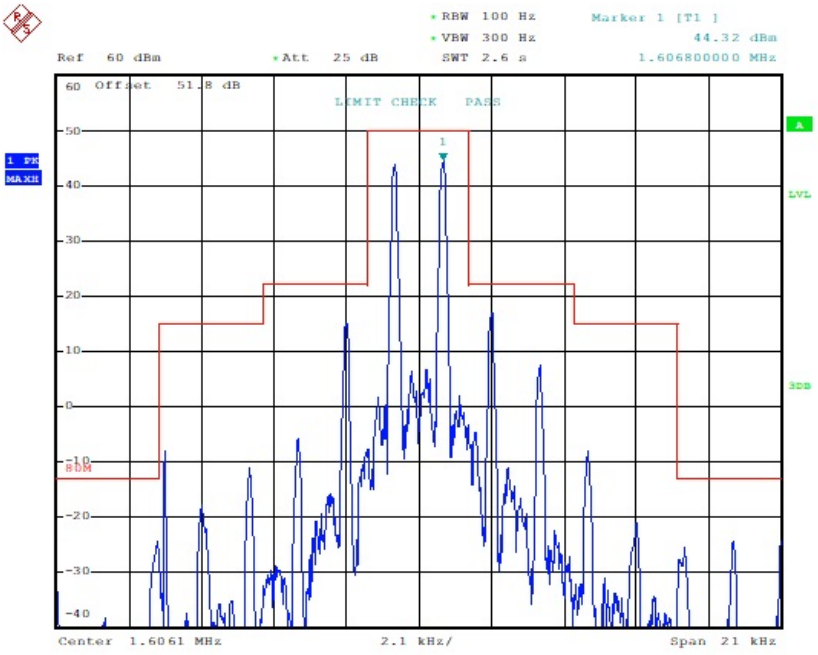
6.5 Test Results

SSB Mode (J3E)

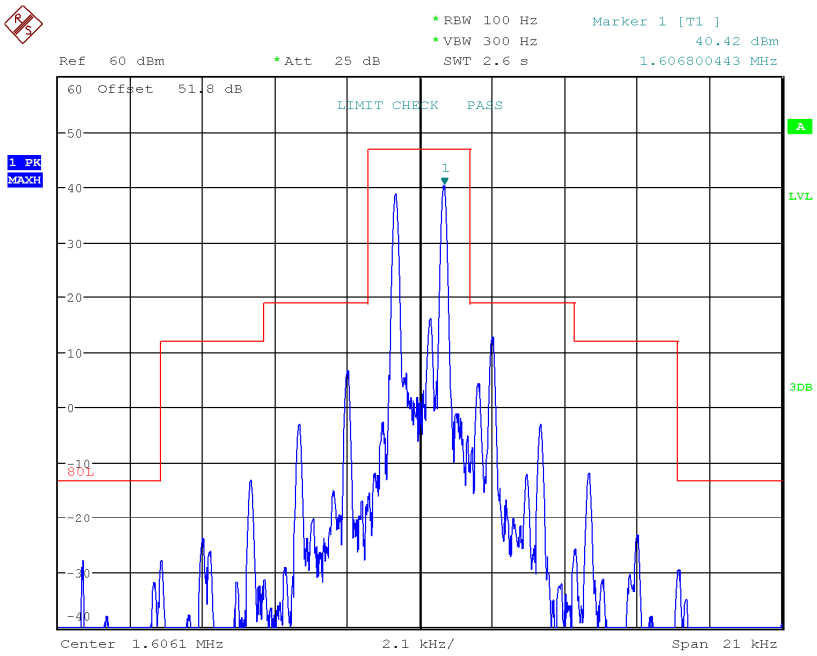
Low Channel @ 1.605 MHz, High Power



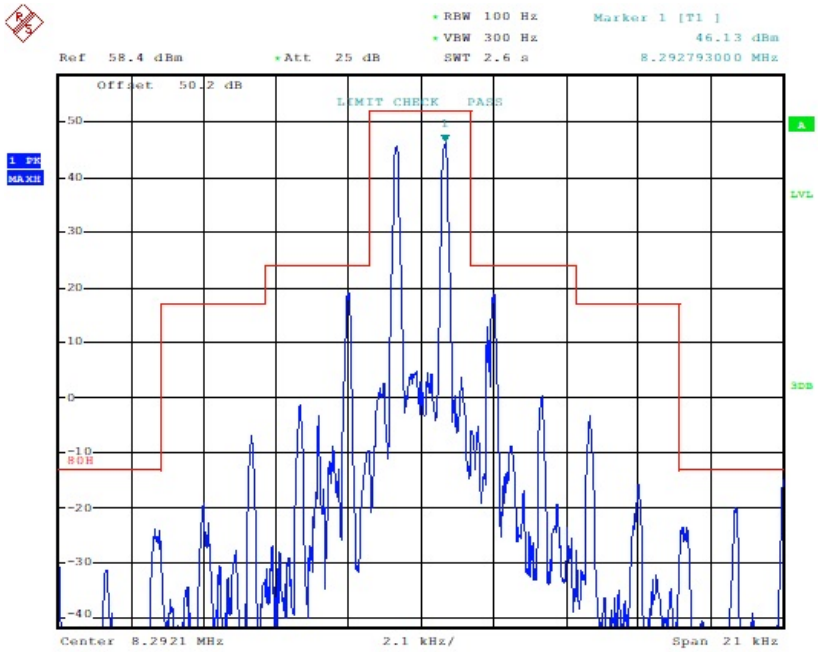
Low Channel @ 1.605 MHz, Middle Power



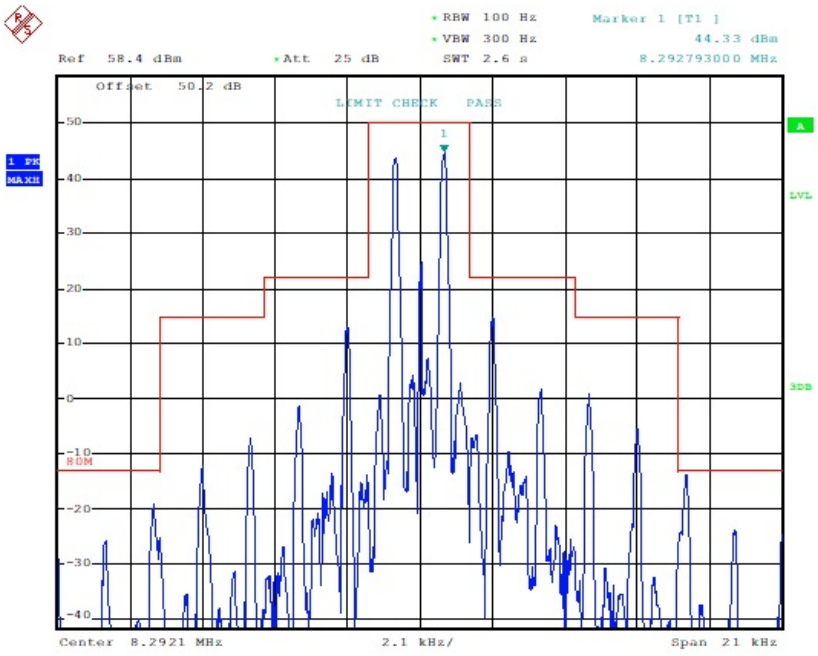
Low Channel @ 1.605 MHz, Low Power



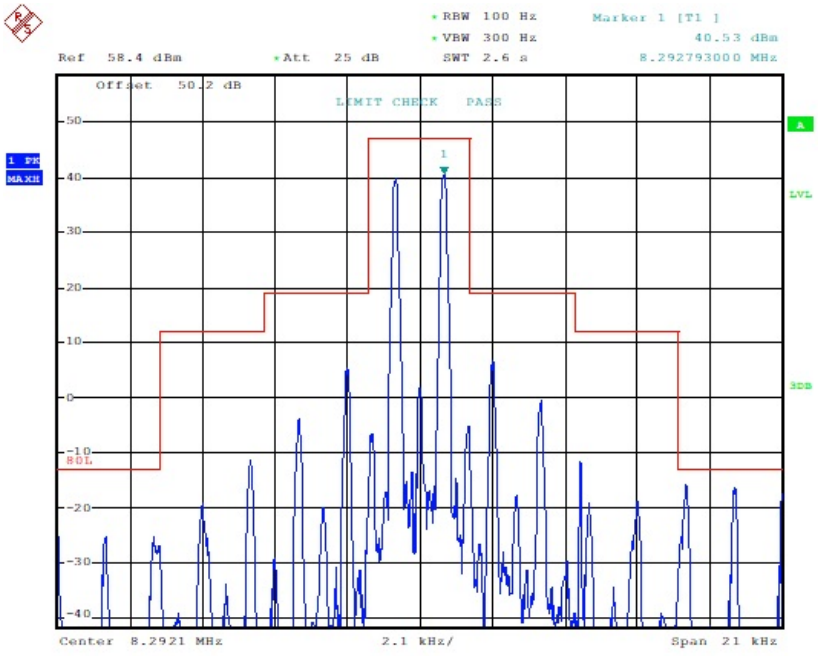
Middle Channel @ 8.291 MHz, High Power



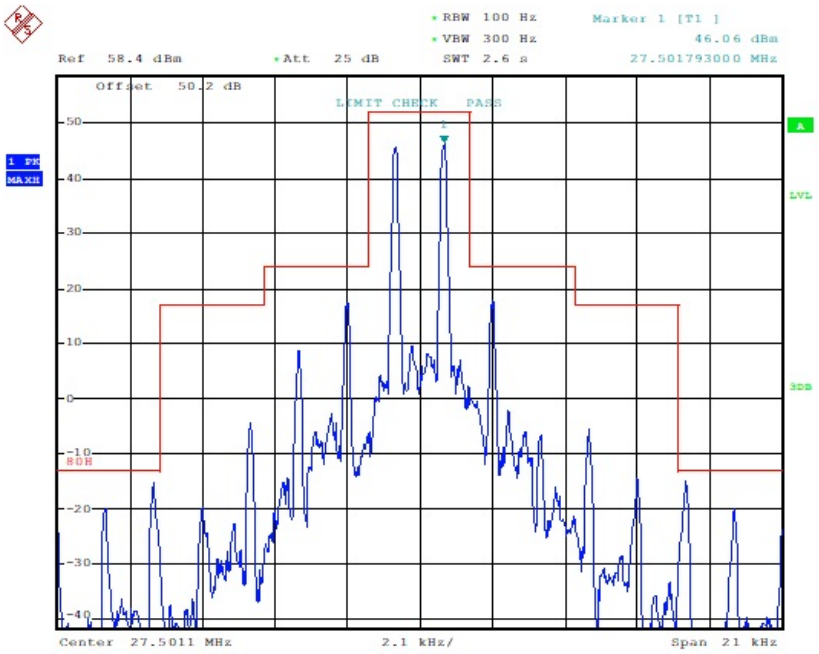
Middle Channel @ 8.291 MHz, Middle Power



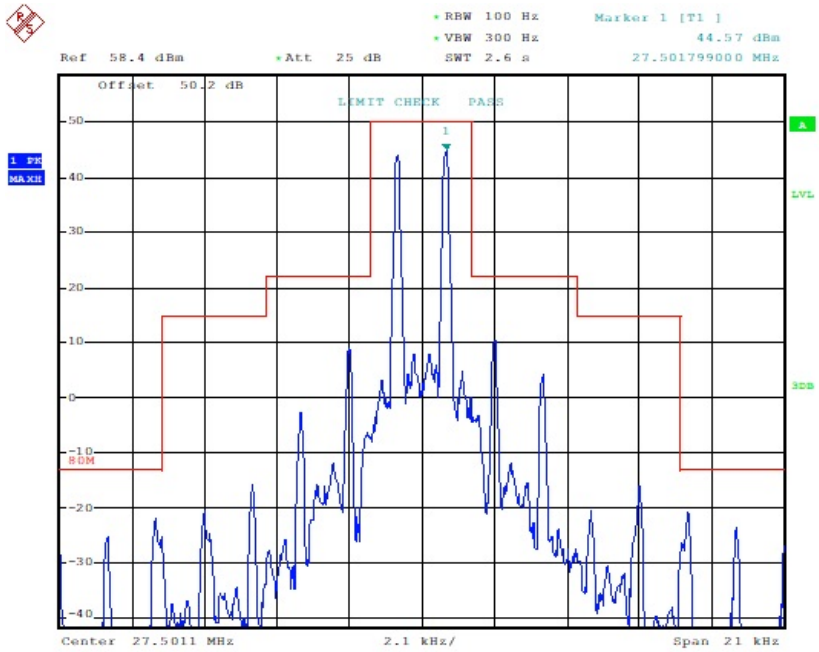
Middle Channel @ 8.291 MHz, Low Power



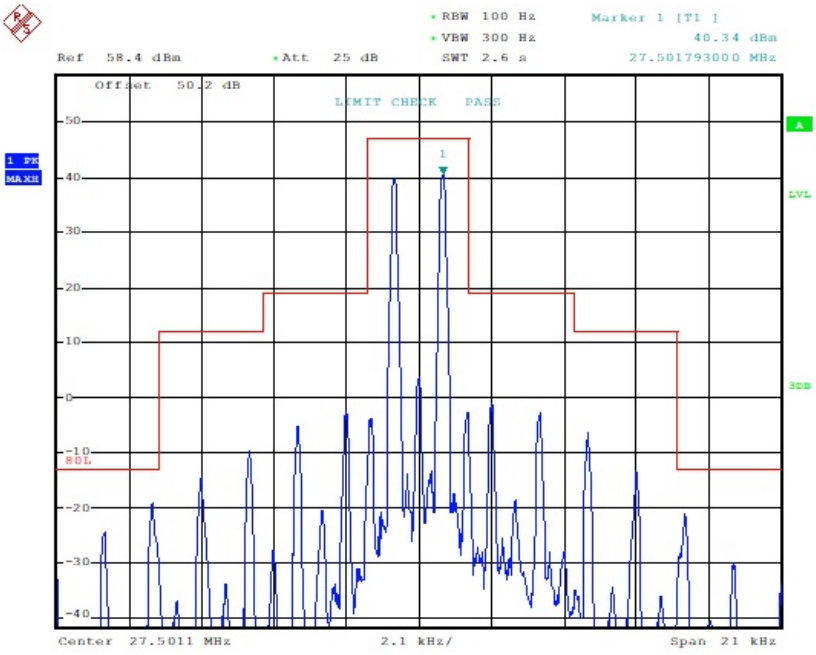
High Channel @ 27.500 MHz, High Power



High Channel @ 27.500 MHz, Middle Power

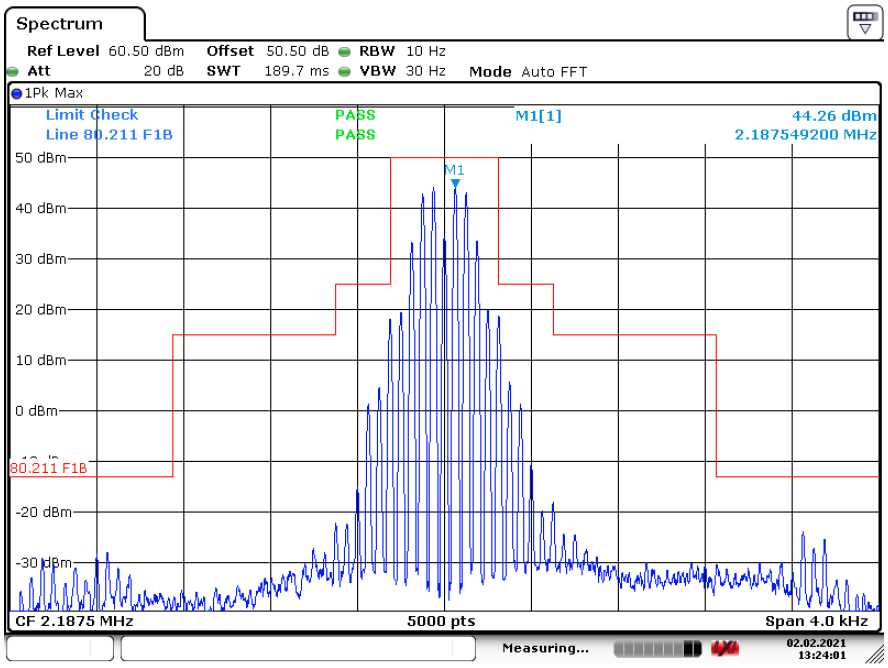


High Channel @ 27.500 MHz, Low Power



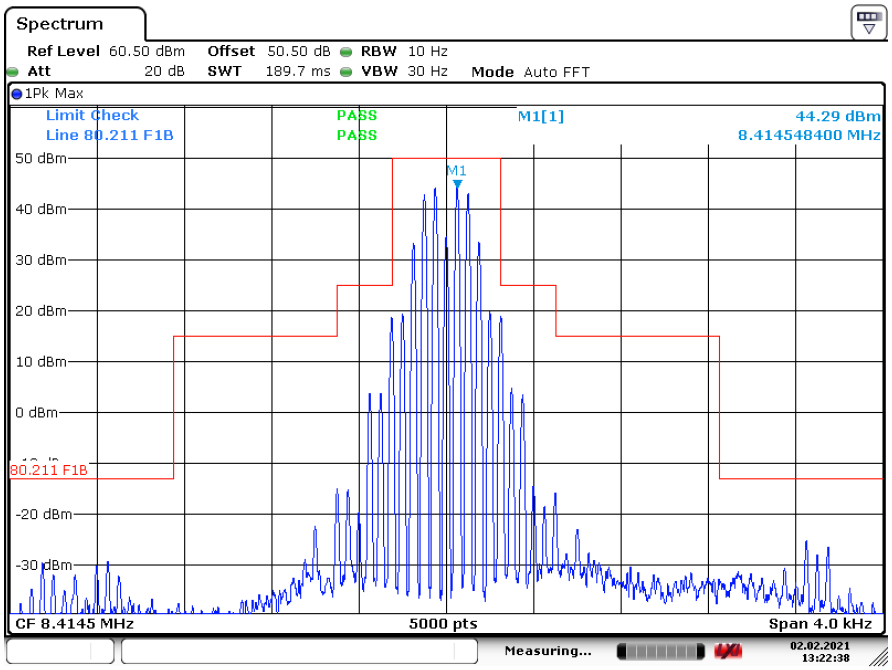
DSC Mode (F1B)

Low Channel @ 2187.5 kHz



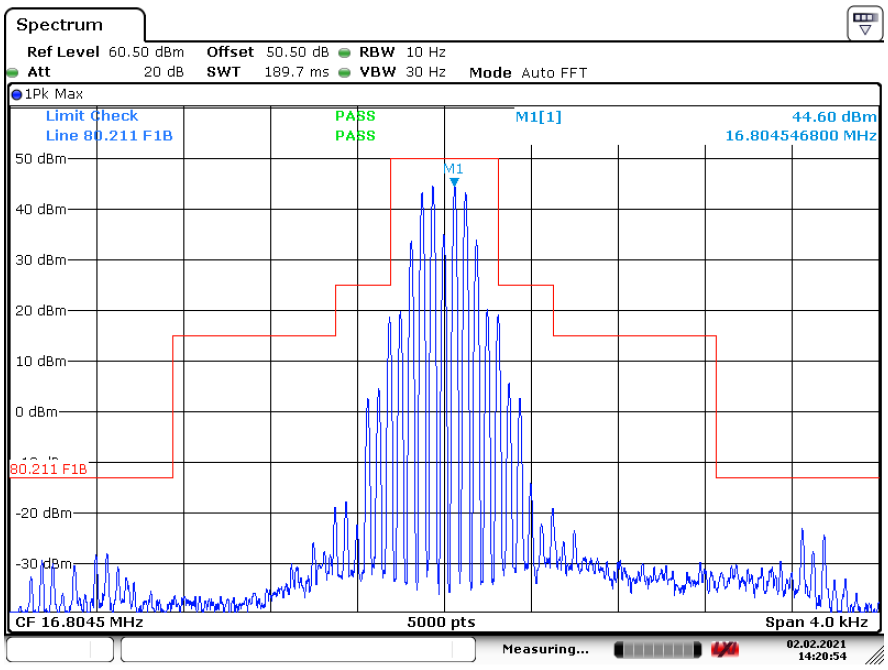
Date: 2.FEB.2021 13:24:01

Middle Channel @ 8414.5 kHz



Date: 2.FEB.2021 13:22:38

High Channel @ 16804.5 kHz



Date: 2.FEB.2021 14:20:55

7 FCC §2.1051, §80.217 (b) & §80.211 (a) (3) - SPURIOUS EMISSION AT ANTENNA TERMINALS, SUPPRESSION OF INTERFERENCE

7.1 Applicable Standards

§2.1051

The radio frequency voltage or powers generated within the equipment and appearing on a spurious frequency shall be checked at the equipment output terminals when properly loaded with a suitable artificial antenna. Curves or equivalent data shall show the magnitude of each harmonic and other spurious emission that can be detected when the equipment is operated under the conditions specified in §2.1049 as appropriate. The magnitude of spurious emissions which are attenuated more than 20 dB below the permissible value need not be specified.

§80.217 (b)

(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

§80.211 (a) (3)

On any frequency removed from the assigned frequency by more than 250 percent of the authorized bandwidth: At least 43 plus 10log10 (mean power in watts) dB.

7.2 Measurement Procedure

Conducted:

TIA 603-E Clause 2.2.13

The RF output of the transceiver was connected to a spectrum analyzer and simulator through appropriate attenuation.

7.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2019-11-07	2 year
Rhode & Schwarz	Signal Analyzer	FSV40	1321.3008K39-101203-UW	2019-08-06	18 Months
API Weinschel, Inc.	Attenuator 40 dB	53-40-43	TY490	Each Time	Each Time
-	RF cable	-	-	Each time[1]	N/A

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

7.4 Test Environmental Conditions

Temperature:	23 ºC
Relative Humidity:	34-46 %
ATM Pressure:	101.3 -102.1 kPa

The testing was performed by Zhao Zhao on 2020-11-16 and on 2021-02-02 at RF Site.

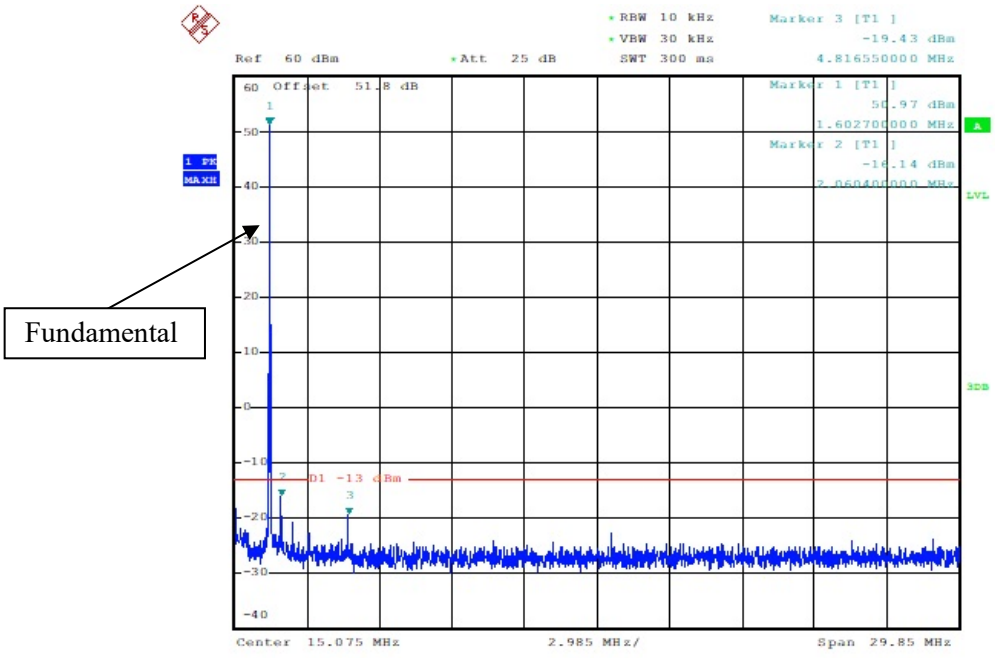
7.5 Test Results

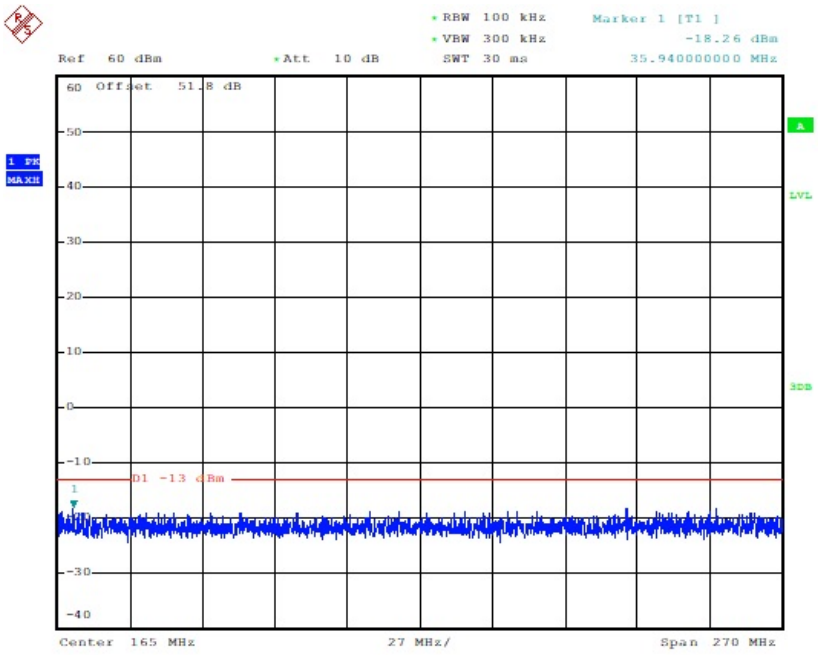
Please refer to the following plots for detailed test results.

SSB Mode (J3E)

Low Channel, High Power

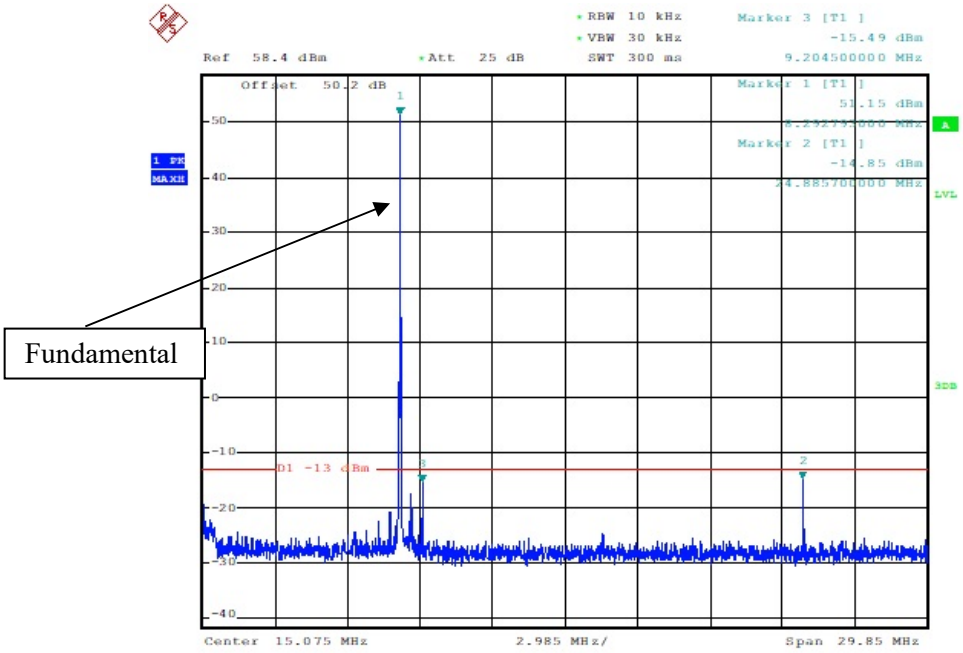
150 kHz to 30 MHz

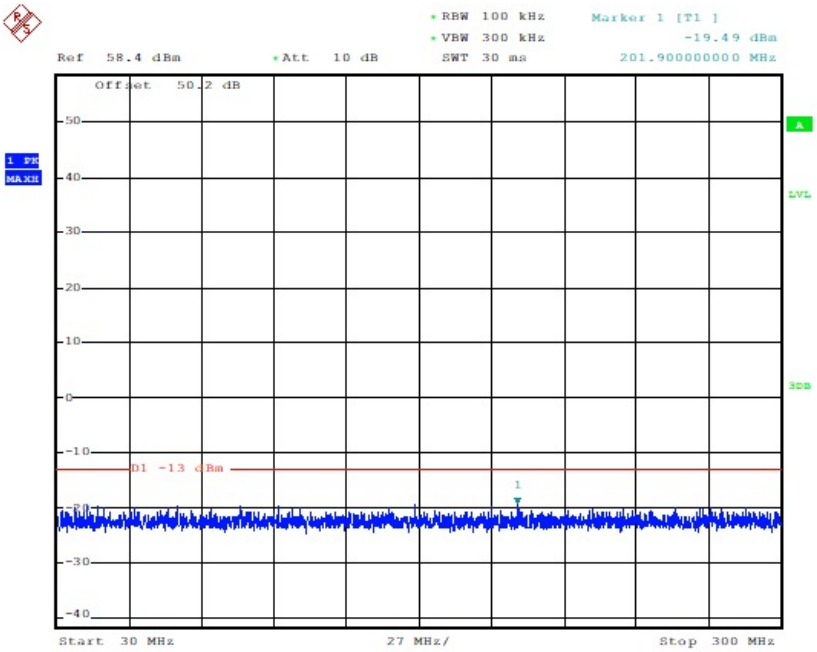




Middle Channel, High Power

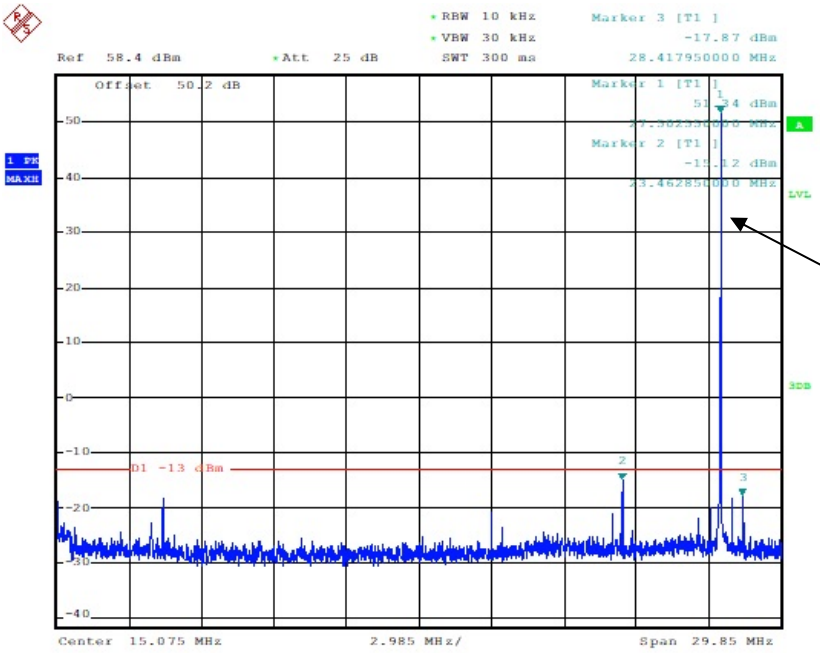
150 kHz to 30 MHz

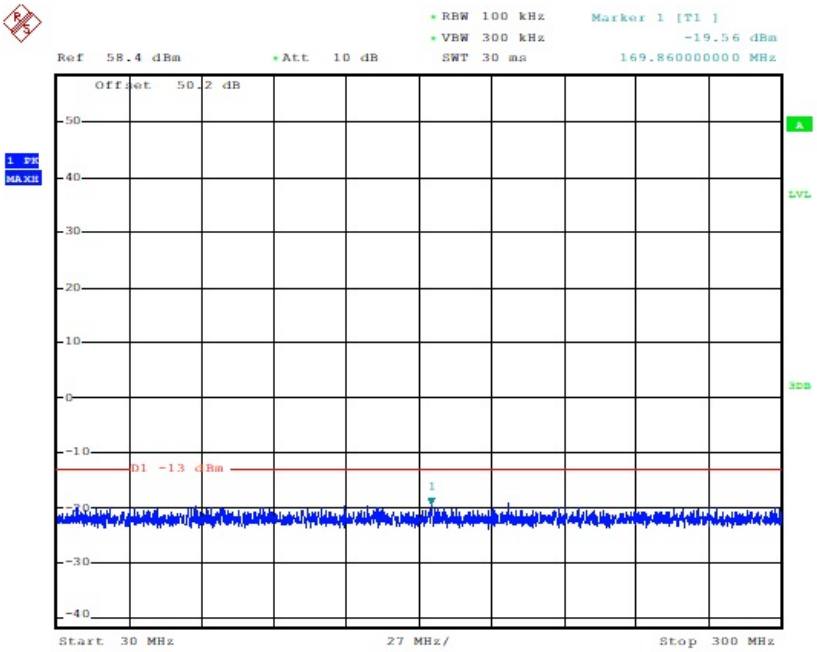




High Channel, High Power

150 kHz to 30 MHz

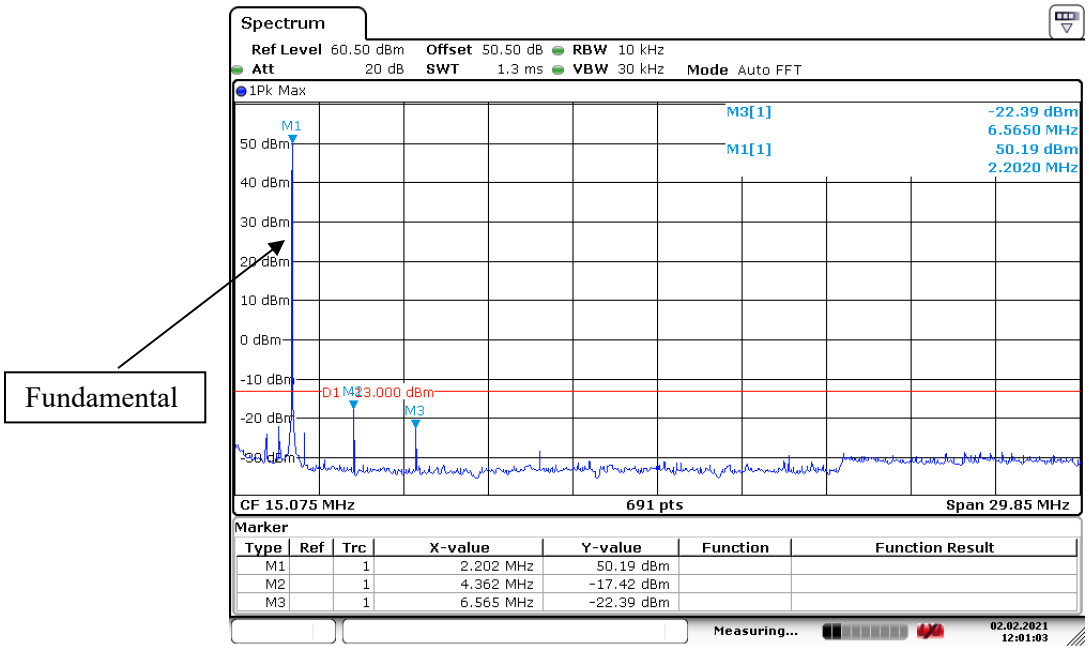




DSC Mode (F1B)

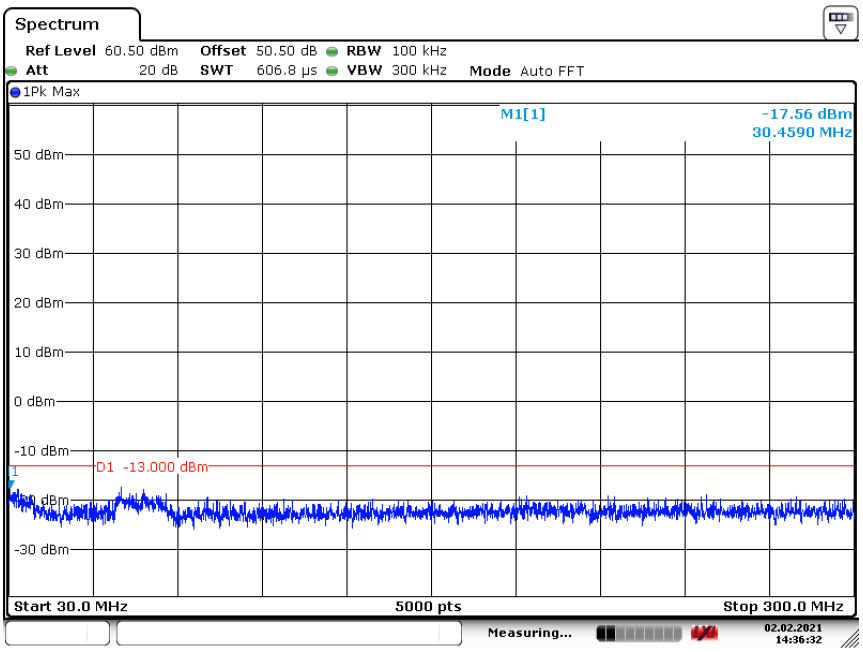
Low Channel

150 kHz to 30 MHz



Date: 2.FEB.2021 12:01:04

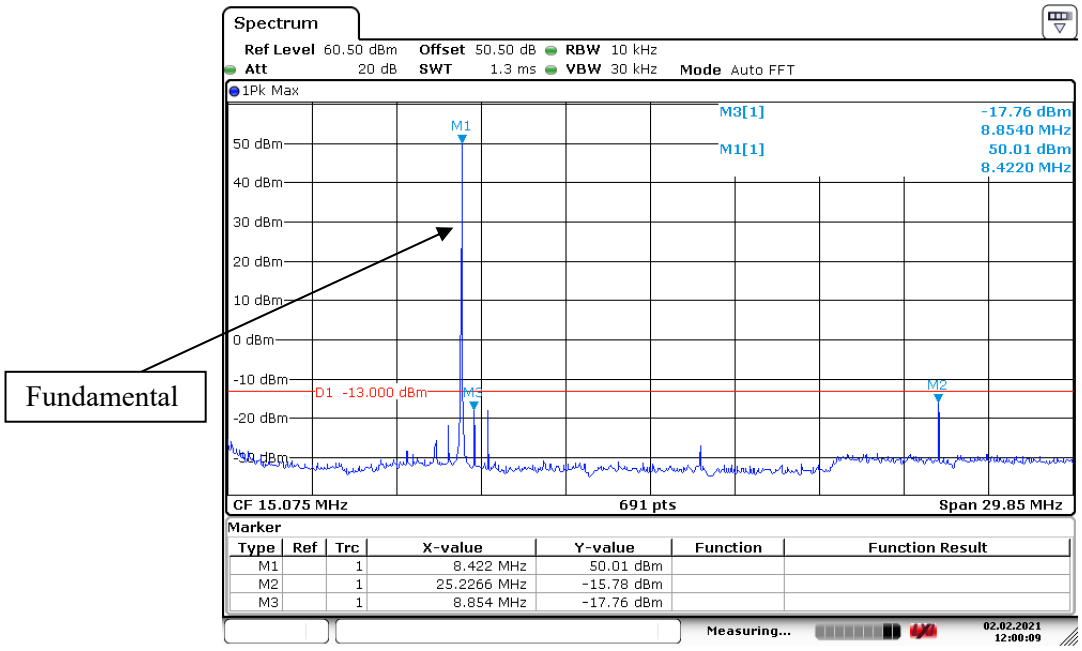
Above 30 MHz



Date: 2.FEB.2021 14:36:33

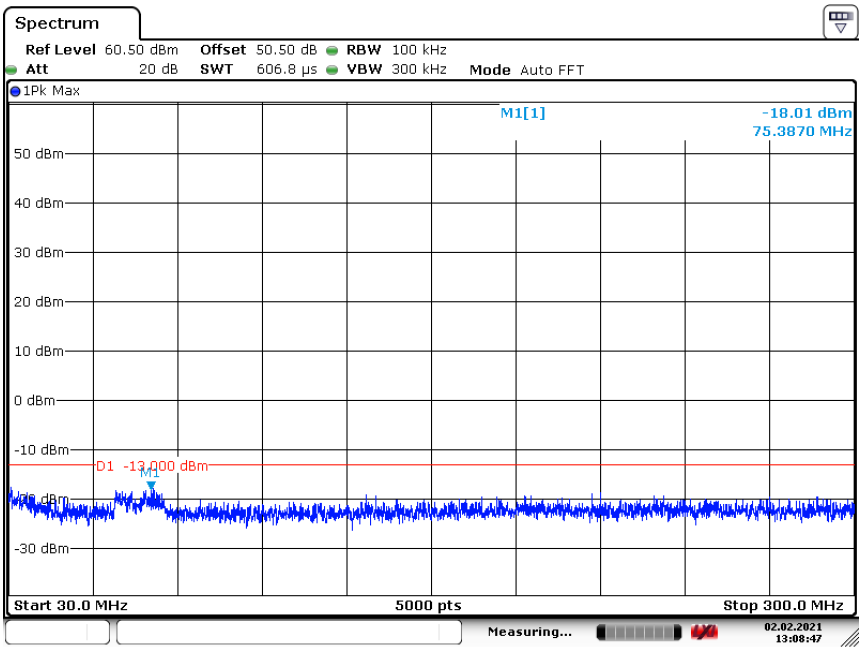
Middle Channel

150 kHz to 30 MHz



Date: 2.FEB.2021 12:00:09

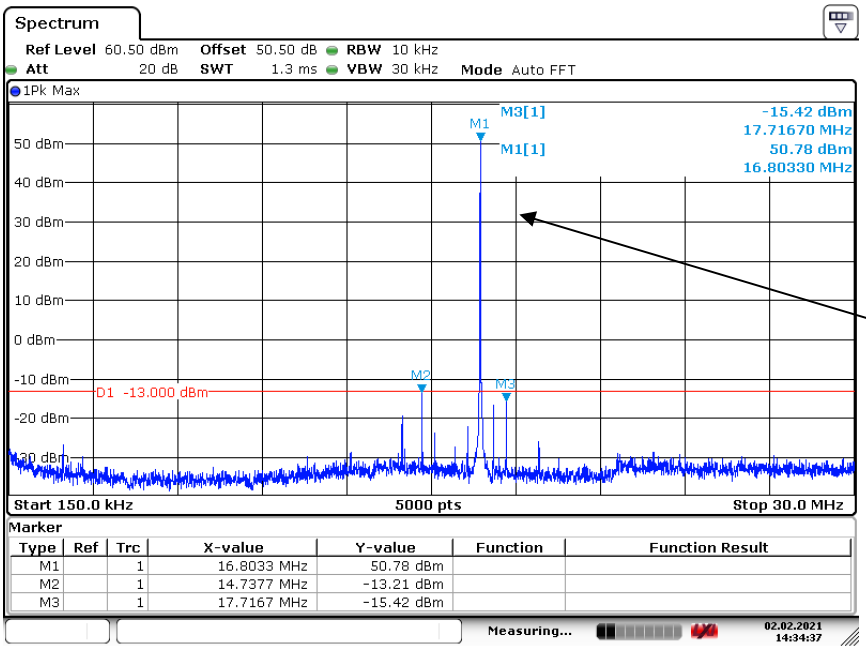
Above 30 MHz



Date: 2.FEB.2021 13:08:47

High Channel

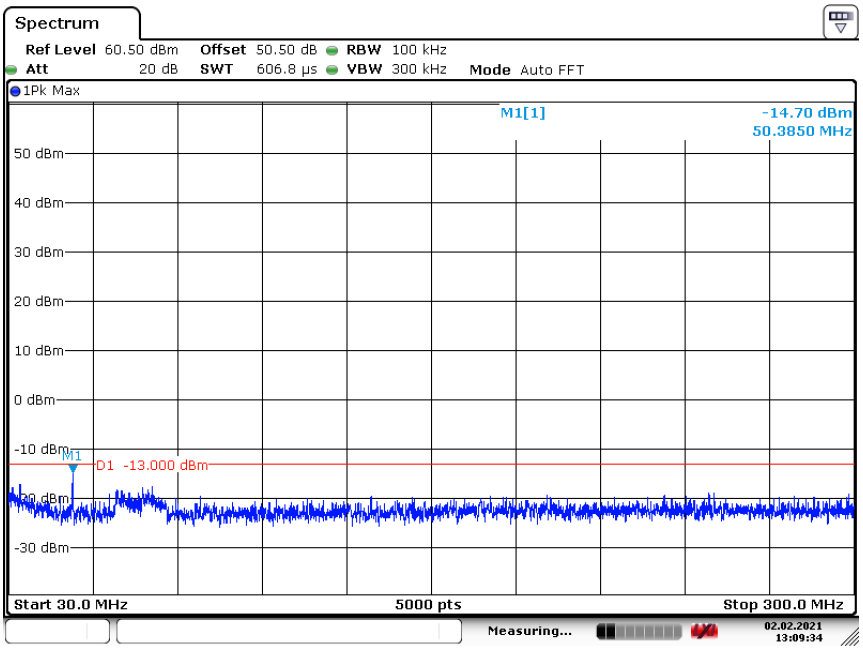
150 kHz to 30 MHz



Fundamental

Date: 2.FEB.2021 14:34:37

Above 30 MHz



Date: 2.FEB.2021 13:09:35

8 FCC §2.1053 & §80.217 (b) - FIELD STRENGTH OF SPURIOUS EMISSION, SUPPRESSION OF INTERFERENCE

8.1 Applicable Standards

§2.1053

(a) Measurements shall be made to detect spurious emissions that may be radiated directly from the cabinet, control circuits, power leads, or intermediate circuit elements under normal conditions of installation and operation. Curves or equivalent data shall be supplied showing the magnitude of each harmonic and other spurious emission. For this test, single sideband, independent sideband, and controlled carrier transmitters shall be modulated under the conditions specified in paragraph (c) of §2.1049, as appropriate. For equipment operating on frequencies below 890 MHz, an open field test is normally required, with the measuring instrument antenna located in the far-field at all test frequencies. In the event it is either impractical or impossible to make open field measurements (e.g. a broadcast transmitter installed in a building) measurements will be accepted of the equipment as installed. Such measurements must be accompanied by a description of the site where the measurements were made showing the location of any possible source of reflections which might distort the field strength measurements. Information submitted shall include the relative radiated power of each spurious emission with reference to the rated power output of the transmitter, assuming all emissions are radiated from halfwave dipole antennas.

(b) The measurements specified in paragraph (a) of this section shall be made for the following equipment:
(1) Those in which the spurious emissions are required to be 60 dB or more below the mean power of the transmitter.
(2) All equipment operating on frequencies higher than 25 MHz.
(3) All equipment where the antenna is an integral part of, and attached directly to the transmitter.
(4) Other types of equipment as required, when deemed necessary by the Commission.

§80.217 (b)

(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

8.2 Measurement Procedure

TIA/EIA 603-E Clause 2.2.12

The transmitter was placed on a wooden turntable, and it was transmitting into a non-radiating load which was also placed on the turntable.

The measurement antenna was placed at a distance of 3 meters from the EUT. During the tests, the antenna height and polarization as well as EUT azimuth were varied in order to identify the maximum level of emissions from the EUT.

The frequency range up to tenth harmonic of the fundamental frequency was investigated.

The EUT Removed and replaced with a substitution antenna. A signal generator was connected to the substitution antenna by a non-radiating cable. The absolute levels of the spurious emissions were measured by the substitution.

Spurious emissions in dB = 10 log (TX Power in Watts) – the absolute level

Spurious attenuation limit in dBm
$= 10 \text{ Log}_{10}$ (Power out in mW) –Attenuation
$= 10 \text{ Log}_{10}$ (Power out in W/0.001) – (43 + 10 Log_{10} (Power out in W))
$= 10 \text{ Log}_{10}$ (Power out in W) – 10 Log_{10} (0.001) -43 -10 Log_{10} (Power out in W)
=30-43
=-13 dBm

8.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	EMI Test Receiver	ESU-40	100433	2020-03-25	1 year
Rohde & Schwarz	EMI Test Receiver	ESCI 1166.5950.03	100338	2020-03-17	1 year
Sunol Science Corp	System Controller	SC99V	011003-1	N/R	N/A
Sunol Sciences	Biconi-Log Antenna	JB1	A013105-3	2020-03-02	2 years
Sonoma	Pre Amplifier	317	260406	2019-11-04	1 year
Sunol Sciences	Biconi-Log Antenna	JB3	A020106-2	2019-11-20	2 years
HP	Pre Amplifier	8447D	2944A07030	2020-08-17	1 year
MDP Digital	Times Microwave LMR 400 UltraFex Coaxial Cable 35\'	LMR400UF	BACL1904161	2020-07-10	1 year
Com-Power	Antenna, Loop Active	AL-130	17043	2018-10-11	2.5 years
Agilent*	Generator, Signal	E4438C	MY45091309	2019-11-05	1 year
HP	Generator, Signal	83650B	3614A00276	2020-06-04	1 year
API Weinschel, Inc.	Attenuator 40 dB	53-40-43	TY490	Each Time	Each Time
COM-POWER	Antenna, Dipole	AD-100 DB-4	721033DB1,721033DB2,721033DB3,521921	2019-03-06	2 years

Note[1]: cable included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

8.4 Test Environmental Conditions

Temperature:	20-24º C
Relative Humidity:	32-46 %
ATM Pressure:	101.8-102.4 kPa

The testing for J3E was performed by Zhao Zhao on 2020 07-29 and 2020-08-10 at 10 meter chamber 1.
The testing for F1B was performed by Zhao Zhao on 2021-03-03 at 5 meter chamber 3.

8.5 Test Results

(1) Below 30 MHz:

SSB Mode (J3E)

High Channel, High Power, Perpendicular:

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity	Turntable Azimuth (degrees)	EIRP[1] (dBm)	Limit (dBm)	Margin (dB)	Comments (PK/QP/Ave.)
1.083104	39.35	100	Perp.	225	-35.03	-13	-22.03	QP
0.644145	43.69	100	Perp.	169	-30.69	-13	-17.69	QP
1.235058	38.3	100	Perp.	137	-36.08	-13	-23.08	QP
1.74807	35.29	100	Perp.	198	-39.09	-13	-26.09	QP
2.204042	33.37	100	Perp.	43	-41.01	-13	-28.01	QP
2.362608	32.83	100	Perp.	84	-41.55	-13	-28.55	QP

High Channel, High Power, Parallel:

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity	Turntable Azimuth (degrees)	EIRP[1] (dBm)	Limit (dBm)	Margin (dB)	Comments (PK/QP/Ave.)
0.736892	42.47	100	Par.	271	-31.91	-13	-18.91	QP
1.063575	39.47	100	Par.	95	-34.91	-13	-21.91	QP
1.267971	38.03	100	Par.	165	-36.35	-13	-23.35	QP
1.415756	37.23	100	Par.	341	-37.15	-13	-24.15	QP
0.762216	42.27	100	Par.	60	-32.11	-13	-19.11	QP
1.772142	35.41	100	Par.	22	-38.97	-13	-25.97	QP

High Channel, High Power, Flat:

Frequency (MHz)	Corrected Amplitude (dBμV/m)	Antenna Height (cm)	Antenna Polarity	Turntable Azimuth (degrees)	EIRP[1] (dBm)	Limit (dBm)	Margin (dB)	Comments (PK/QP/Ave.)
0.596825	44.42	100	Flat	279	-29.96	-13	-16.96	QP
1.637375	35.88	100	Flat	201	-38.50	-13	-25.50	QP
1.443314	36.99	100	Flat	155	-37.39	-13	-24.39	QP
1.228902	38.29	100	Flat	176	-36.09	-13	-23.09	QP
0.697748	42.93	100	Flat	339	-31.45	-13	-18.45	QP
1.852883	34.82	100	Flat	161	-39.56	-13	-26.56	QP

Note[1]: the EIRP is derived from the measured field strength at 10m by applying the following equation.

EIRP (dBm) = E (dBuV/m) @ 10m + 40*log(10/3) – 95.3 dB

DSC Mode (F1B)

No emission found for F1B during pre-scan.

(2) Above 30 MHz:

SSB Mode (J3E)

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dBi/dBd)	Cable Loss (dB)			
High Channel, High Power											
50.141	41.8	29	397	V	50.141	-53.2	0	0.44	-53.64	-13	-40.64
75.217	39.7	100	144	V	75.217	-55.3	0	0.44	-55.74	-13	-42.74
125.379	36.9	105	211	V	125.379	-60.1	0	0.5	-60.6	-13	-47.6
200.61	28.3	90	106	V	200.61	-71.7	0	0.50	-72.2	-13	-59.2

DSC Mode (F1B)

Freq. (MHz)	S.A. Amp. (dBµV)	Table Azimuth (Degrees)	Test Antenna		Substitution				Absolute Level (dBm)	Limit (dBm)	Margin (dB)
			Height (cm)	Polar (H/V)	Freq. (MHz)	S.G. Level (dBm)	Antenna Gain (dBi/dBd)	Cable Loss (dB)			
High Channel											
50.385	40.02	197	194	V	50.385	-67.98	0	0.44	-68.42	-13	-55.42
67.26	40.85	360	121	V	67.26	-67.15	0	0.44	-67.59	-13	-54.59
84.00	56.94	360	121	V	84.00	-51.06	0	0.44	-51.5	-13	-38.5
120.10	36.91	360	231	H	120.10	-72.09	0	0.50	-72.59	-13	-59.59

9 FCC §2.1055 & §80.209 - FREQUENCY STABILITY, TRANSMITTER FREQUENCY TOLERANCE

9.1 Applicable Standards

CFR47 §2.1055, §80.209 (a)

(a) The frequency tolerance requirements applicable to transmitters in the maritime services are shown in the following.

(2) Band 1600-4000 kHz:	
(i) Coast stations and Alaska fixed stations:	
For single sideband and facsimile	20 Hz.
For narrow-band direct printing and data emissions	10 Hz.
For transmitters with digital selective calling emissions	10 Hz.
For all other emissions	50 Hz.
(ii) Ship stations:	
For transmitters with narrow-band direct printing and data emissions	10 Hz.
For transmitters with digital selective calling emissions	10 Hz.
For all other transmitters	20 Hz.
(iii) Survival craft stations:	20 Hz.
(iv) Radiodetermination stations:	
With power 200W or less	20.
With power above 200W	10.
(3) Band 4000-27500 kHz:	
(i) Coast stations and Alaska fixed stations:	
For single sideband and facsimile emissions	20 Hz.
For narrow-band direct printing and data emissions	10 Hz.
For digital selective calling emissions	10 Hz.
For Morse telegraphy emissions	10.
For all other emissions	15 Hz.

9.2 Measurement Procedure

Frequency Stability vs. Temperature:

The equipment under test was connected to an external DC power supply and the RF output was connected to a frequency counter via feed through attenuators. EUT was placed inside the temperature chamber. The DC leads and RF output cable exited the chamber through an opening made for the purpose.

After the temperature stabilized for approximately 20 minutes, the frequency output was recorded from the frequency counter.

Frequency Stability vs. Voltage:

An external variable DC power supply was connected to the EUT, The voltage was set to 115%, 100%, and 85% of the nominal operating input voltage, and the frequency output was recorded from the frequency counter.

9.3 Test Equipment List and Details

Manufacturer	Description	Model No.	Serial No.	Calibration Date	Calibration Interval
Rohde & Schwarz	Signal Analyzer	FSQ26	200749	2019-11-07	2 years
BACL	Temp and Humi Chamber	BTH-150-40	30078	2020-06-25	1 year
-	RF cable	-	-	Each time[1]	N/A
API Weinschel, Inc.	Attenuator 40 dB	53-40-43	TY490	Each Time	Each Time

Note[1]: cable and attenuator included in the test set-up will be checked each time before testing.
Statement of Traceability: BACL Corp. *attests that all of the calibrations on the equipment items listed above were traceable to NIST or to another internationally recognized National Metrology Institute (NMI), and were compliant with the latest version of A2LA policy P102 "A2LA Policy on Metrological Traceability".*

9.4 Test Environmental Conditions

Temperature:	24º C
Relative Humidity:	32 %
ATM Pressure:	101.3 kPa

The testing was performed by Zhao Zhao on 2020-11-17 and from 2021-02-02 to 2021-02-03 at temperature chamber.

9.5 Test Results

SSB (J3E)

Frequency Stability with Temperature (Tone 1400 Hz)

Supply Voltage (Vdc)	Temperature (°C)	Carrier Frequency (kHz)	Measured Frequency (kHz)	Frequency Error (Hz)	Limit (Hz)
24.00	-20	1605	1606.4013	+1.3	± 10
		8291	8292.4013	+1.3	± 10
		27500	27501.4038	+3.8	± 10
	-10	1605	1606.4013	+1.3	± 10
		8291	8292.4013	+1.3	± 10
		27500	27501.4038	+3.8	± 10
	0	1605	1606.4013	+1.3	± 10
		8291	8292.4013	+1.3	± 10
		27500	27501.4013	+1.3	± 10
	10	1605	1606.4013	+1.3	± 10
		8291	8292.4013	+1.3	± 10
		27500	27501.4013	+3.0	± 10
	20	1605	1606.4010	+1.0	± 10
		8291	8292.4010	+1.0	± 10
		27500	27501.4050	+5.0	± 10
	30	1605	1606.4010	+1.0	± 10
		8291	8292.4030	+3.0	± 10
		27500	27501.4070	+7.0	± 10
	40	1605	1606.4010	+1.0	± 10
		8291	8292.4030	+3.0	± 10
		27500	27501.4070	+7.0	± 10
	50	1605	1606.4010	+1.0	± 10
		8291	8292.4010	+1.0	± 10
		27500	27501.4010	+1.0	± 10

Note: Frequency Error = Measured Frequency – Channel Frequency – Tone (1400 Hz)

Frequency Stability with Supply Voltage (Tone 1400 Hz)

Voltage Variation (%)	Supply Voltage (V)	Channel Frequency (kHz)	Frequency (kHz)	Frequency Error (Hz)	Limit (Hz)
-15.0	20.4	1605	1606.4010	+1.0	± 10
		8291	8292.4010	+1.0	± 10
		27500	27501.4050	+5.0	± 10
+15.0	27.6	1605	1606.4010	+1.0	± 10
		8291	8292.4010	+1.0	± 10
		27500	27501.4050	+5.0	± 10

Note: Frequency Error = Measured Frequency – Channel Frequency – Tone (1400 Hz)

DSC (F1B)

Frequency Stability with Temperature

Supply Voltage (Vdc)	Temperature (°C)	Carrier Frequency (kHz)	Measured Frequency (kHz)	Frequency Error (Hz)	Limit (Hz)
24.00	-20	2187.5	2187.499532	-0.468	± 10
		8414.5	8414.498156	-1.844	± 10
		16804.5	16804.496684	-3.316	± 10
	-10	2187.5	2187.499516	-0.484	± 10
		8414.5	8414.498260	-1.74	± 10
		16804.5	16804.496580	-3.42	± 10
	0	2187.5	2187.499572	-0.428	± 10
		8414.5	8414.498476	-1.524	± 10
		16804.5	16804.496996	-3.004	± 10
	10	2187.5	2187.499580	-0.42	± 10
		8414.5	8414.498508	-1.492	± 10
		16804.5	16804.496948	-3.052	± 10
	20	2187.5	2187.499604	-0.396	± 10
		8414.5	8414.498652	-1.348	± 10
		16804.5	16804.497260	-2.74	± 10
	30	2187.5	2187.499588	-0.412	± 10
		8414.5	8414.498580	-1.42	± 10
		16804.5	16804.497148	-2.852	± 10
	40	2187.5	2187.499572	-0.428	± 10
		8414.5	8414.498460	-1.54	± 10
		16804.5	16804.496948	-3.052	± 10
	50	2187.5	2187.499492	-0.508	± 10
		8414.5	8414.498204	-1.796	± 10
		16804.5	16804.496508	-3.492	± 10

Frequency Stability with Supply Voltage

Voltage Variation (%)	Supply Voltage (V)	Channel Frequency (kHz)	Frequency (kHz)	Frequency Error (Hz)	Limit (Hz)
-15.0	20.4	2187.5	2187.499572	-0.428	± 10
		8414.5	8414.498476	-1.524	± 10
		16804.5	16804.496956	-3.044	± 10
+15.0	27.6	2187.5	2187.499580	-0.42	± 10
		8414.5	8414.498484	-1.516	± 10
		16804.5	16804.497004	-2.996	± 10

10 FCC §2.1091 & §80.227 - RADIOFREQUENCY RADIATION EXPOSURE EVALUATION: MOBILE DEVICE, SPECIAL REQUIREMENT FOR PROTECTION FROM RF RADIATION

10.1 Applicable Standards

§2.1091

(a) Requirements of this section are a consequence of Commission responsibilities under the National Environmental Policy Act to evaluate the environmental significance of its actions. See subpart I of part 1 of this chapter, in particular §1.1307(b).

§80.227

According to §1.1307(b)(1), systems operating under the provisions of this section shall be operated in a manner that ensures that the public is not exposed to radio frequency energy level in excess of the Commission's guidelines.

According to §1.1310 and §2.1091 RF exposure is calculated.

Limits for Occupational/Controlled Exposure

Frequency Range (MHz)	Electric Field Strength (V/m)	Magnetic Field Strength (A/m)	Power Density (mW/cm^2)	Averaging Time (minutes)
Limits for Occupational/Controlled Exposure				
0.3-1.34	614	1.63	*(100)	6
1.34-30	1842/f	4.89/f	*($900/f^2$)	6
30-300	61.4	0.163	1.0	6
300-1500	/	/	f/300	6
1500-100,000	/	/	5.0	6

f = frequency in MHz
* = Plane-wave equivalent power density

10.2 MPE Prediction

Predication of MPE limit at a given distance, Equation from OET Bulletin 65, Edition 97-01

$$S = PG/4\pi R^2$$

Where: S = power density
P = power input to antenna
G = power gain of the antenna in the direction of interest relative to an isotropic radiator
R = distance to the center of radiation of the antenna

10.3 Test Results

SSB mode (J3E)

Low Channel:

Rated maximum peak conducted output power (dBm):	51.761
Rated maximum peak conducted output power (mW):	150000
Predication distance (cm):	20
Predication frequency (MHz):	1.605
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
Power density of prediction frequency at prediction distance (mW/cm^2):	59.53
FCC limit (mW/cm^2):	349.38

Middle Channel

Rated maximum peak conducted output power (dBm):	51.761
Rated maximum peak conducted output power (mW):	150000
Predication frequency (MHz):	8.291
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
FCC MPE limit for controlled exposure at predication frequency (mW/cm^2):	13.09
Predication distance (cm):	42.71

High Channel:

Rated maximum peak conducted output power (dBm):	51.761
Rated maximum peak conducted output power (mW):	150000
Predication frequency (MHz):	27.500
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
FCC MPE limit for controlled exposure at predication frequency (mW/cm^2):	1.19
Predication distance (cm):	141.64

Results

Low channel:
The device is compliant with the requirement MPE limit for controlled exposure. The maximum power density at the distance of 20 cm is59.68 mW/cm^2. Which is compliant with the limit 349.38 mW/cm^2.

Middle Channel:
The device is compliant with the requirement MPE limit for controlled exposure. The maximum power density at the distance of 42.71 cm is 13.09mW/cm^2. Thus the minimum compliant distance is 42.19cm.

High Channel:
The device is compliant with the requirement MPE limit for controlled exposure. The maximum power density at the distance of 141.64 cm is 1.19mW/cm^2. Thus the minimum compliant distance is 141.64 cm.

DSC mode (F1B)

Low Channel:

Maximum peak conducted output power (dBm):	50.31
Maximum peak conducted output power (mW):	107398.94
Predication distance (cm):	20
Predication frequency (MHz):	2.1875
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
Power density of prediction frequency at predication distance (mW/cm^2):	42.63
FCC limit (mW/cm^2):	188.1

Middle Channel

Maximum peak conducted output power (dBm):	50.24
Maximum peak conducted output power (mW):	105681.75
Predication frequency (MHz):	8.4145
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
FCC MPE limit for controlled exposure at predication frequency (mW/cm^2):	12.71
Predication distance (cm):	36.33

High Channel:

Maximum peak conducted output power (dBm):	50.57
Maximum peak conducted output power (mW):	114024.98
Predication frequency (MHz):	16.8045
Maximum Antenna Gain, typical (dBi):	3.0
Maximum Antenna Gain (numeric):	2.0
FCC MPE limit for controlled exposure at predication frequency (mW/cm^2):	3.19
Predication distance (cm):	75.34

Results

Low channel:
The device is compliant with the requirement MPE limit for controlled exposure. The maximum power density at the distance of 20 cm is 42.63 mW/cm^2. Which is compliant with the limit 188.1 mW/cm^2.

Middle Channel:
The device is compliant with the requirement MPE limit for controlled exposure. The maximum power density at the distance of 36.33 cm is 12.71mW/cm^2. Thus the minimum compliant distance is 36.33 cm.

High Channel:
The device is compliant with the requirement MPE limit for controlled exposure. The maximum power density at the distance of 75.34 cm is 3.19mW/cm^2. Thus the minimum compliant distance is 75.34 cm.

Note: antenna gain is provided by manufacturer.

11 FCC §80.221 - SPECIAL REQUIREMENTS FOR AUTOMATICALLY GENERATING THE RADIOTELEPHONE ALARM SIGNAL

11.1 Applicable Standards

(a) Each device for automatically generating the radiotelephone alarm signal must be capable of being disabled to permit the immediate transmission of a distress call and message.

(b) The device must comply with the following requirements:

(1) The frequency tolerance of each tone must be ±1.5 percent;

(2) The duration tolerance of each tone must be ±50 milliseconds;

(3) The interval between successive tones must not exceed 50 milliseconds; and

(4) The amplitude ratio of the tones must be flat within 1.6 dB.

(c) Devices installed on or after January 1, 1983, must comply with the following requirements:

(1) The frequency tolerance of each tone must be ±1.5 percent;

(2) The duration tolerance of each tone must be ±10 milliseconds;

(3) The interval between successive tones must not exceed 4 milliseconds;

(4) The amplitude ratio of the tones must be flat within 1.6 dB;

(5) The output of the device must be sufficient to modulate the associated transmitter for H2B emission to at least 70 percent, and for J2B emission to within 3 dB of the rated peak envelope power;

(6) Light from the device must not interfere with the safe navigation of the ship;

(7) After activation the device must automatically generate the radiotelephone alarm signal for not less than 30 seconds and not more than 60 seconds unless manually interrupted;

(8) After generating the radiotelephone alarm signal or after manual interruption the device must be immediately ready to repeat the signal;

(9) The transmitter must be automatically switched from the stand-by condition to the transmit condition at the start and return to the stand-by condition at the conclusion of the radiotelephone alarm signal.

(d) Any device used by a station to automatically generate the radiotelephone alarm signal must be certificated by the Commission.

☒ **Compliant** ☐ **N/A**

12 FCC §80.225 - REQUIREMENTS FOR SELECTIVE CALLING

12.1 Applicable Standards

(a) The requirements for DSC equipment voluntarily installed in coast or ships stations are as follows:

(1) Prior to March 25, 2009, DSC equipment must meet the requirements of the following standards in order to be approved for use:

(i) RTCM Paper 56–95/SC101–STD, RTCM Recommended Minimum Standards for Digital Selective Calling (DSC) Equipment Providing Minimum Distress and Safety Capability," Version 1.0, August 10, 1995, and ITU–R Recommendation M.493–10, "Digital Selective-calling System for Use in the Maritime Mobile Service," with Annexes 1 and 2, 2000 (including only equipment classes A, B, D, and E); or

(ii) ITU–R Recommendation M.493–11, "Digital Selective-calling System for Use in the Maritime Mobile Service," with Annexes 1 and 2, 2004, and, in the case of Class D DSC equipment only, IEC 62238, First edition, "Maritime navigation and radiocommunication equipment and systems—VHF radiotelephone equipment incorporating Class `D' Digital Selective Calling (DSC)—Methods of testing and required test results," March 2003.

☒ **Compliant** ☐ **N/A**

13 FCC §80.229 - SPECIAL REQUIREMENTS FOR AUTOMATIC LINK ESTABLISHMENT

13.1 Applicable Standards

Brief signaling for the purposes of measuring the quality of a radio channel and thereafter establishing communication shall be permitted within the 2 MHz–30 MHz band. Public coast stations providing high seas service are authorized by rule to use such signaling under the following conditions:

(a) The transmitter power shall not exceed 100 W ERP;

(b) Transmissions must sweep linearly in frequency at a rate of at least 60 kHz per second, occupying any 3 kHz bandwidth for less than 50 milliseconds;

(c) The transmitter shall scan the band no more than four times per hour;

(d) Transmissions within 6 kHz of the following protected frequencies and frequency bands must not exceed 10 μW peak ERP:

(1) Protected frequencies (kHz)

2091.0	4188.0	6312.0	12290.0	16420.0
2174.5	4207.5	8257.0	12392.0	16522.0
2182.0	5000.0	8291.0	12520.0	16695.0
2187.5	5167.5	8357.5	12563.0	16750.0
2500.0	5680.0	8364.0	12577.0	16804.5
3023.0	6215.0	8375.0	15000.0	20000.0
4000.0	6268.0	8414.5	16000.0	25000.0
4177.5	6282.0	10000.0		

(2) Protected bands (kHz)

4125.0–4128.0
8376.25–8386.75
13360.0–13410.0
25500.0–25670.0

(e) The instantaneous signal, which refers to the peak power that would be measured with the frequency sweep stopped, along with spurious emissions generated from the sweeping signal, must be attenuated below the peak carrier power (in watts) as follows:

(1) On any frequency more than 5 Hz from the instantaneous carrier frequency, at least 3 dB;

(2) On any frequency more than 250 Hz from the instantaneous carrier frequency, at least 40 dB; and

(3) On any frequency more than 7.5 kHz from the instantaneous carrier frequency, at least $43 + 10\log_{10}$(peak power in watts) db.

☐ **Compliant** ☒ **N/A**

15 Annex A (Normative) - EUT Test Setup Photographs

Please refer to the attachment.

16 Annex B (Normative) - EUT External Photographs

Please refer to the attachment.

17 Annex C (Normative) - EUT Internal Photographs

Please refer to the attachment.

18 Annex D (Normative) - A2LA Electrical Testing Certificate

Accredited Laboratory

A2LA has accredited

BAY AREA COMPLIANCE LABORATORIES CORP.

Sunnyvale, CA

for technical competence in the field of

Electrical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets A2LA *R222 - Specific Requirements EPA ENERGY STAR Accreditation Program*. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (*refer to joint ISO-ILAC-IAF Communiqué dated April 2017*).

Presented this 10th day of March 2021.

Trace McInturff, Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2022

For the tests to which this accreditation applies, please refer to the laboratory's Electrical Scope of Accreditation.

Please follow the web link below for a full ISO 17025 scope

https://www.a2la.org/scopepdf/3297-02.pdf

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