# FCC PART 74, SUBPART H
# TEST AND MEASUREMENT REPORT

For

## Lectrosonics, Inc.

581 Laser Road NE Rio Rancho, NM 87124, USA

**FCC ID: DBZSMQV21A**

| **Report Type:** | **Product Type:** |
|---|---|
| Original Report | Wireless Microphone Transmitter |

| | |
|---|---|
| **Prepared By:** | Vincent Licata<br>Test Engineer |
| **Report Number:** | R1807307-74 |
| **Report Date:** | 2018-09-25 |
| **Reviewed By:** | Jin Yang<br>RF Lead |
| **Test Laboratory:** | Bay Area Compliance Laboratories Corp.<br>1274 Anvilwood Avenue,<br>Sunnyvale, CA 94089, USA<br>Tel: (408) 732-9162<br>Fax: (408) 732 9164 |

Note: This test report is prepared for the customer shown above and for the device described herein. It may not be duplicated or used in part without prior written consent from Bay Area Compliance Laboratories Corp. This report must not be used by the customer to claim product certification, approval, or endorsement by A2LA* or any agency of the Federal Government. * This report may contain data that are not covered by the A2LA accreditation and are marked with an asterisk "*" (Rev.3)

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## DOCUMENT REVISION HISTORY

| Revision Number | Report Number | Description of Revision | Date of Revision |
|---|---|---|---|
| 0 | R1807307-74 | Original Report | 2018-09-25 |

# 1 General Description

## 1.1 Product Description for Equipment Under Test (EUT)

This test and measurement report has been compiled on behalf of *Lectrosonics, Inc.* and their product model: *SMQV-21, FCC ID: DBZSMQV21A,* which henceforth is referred to as the EUT (Equipment Under Test). The EUT is a wireless microphone transmitter. The EUT operates in the frequency range: 537.6-563.175 MHz.

A similar model: *SMV-21* has been declared to be electrically identical with the model tested by the applicant. Please refer to DoS letter.

## 1.2 Mechanical Description of EUT

The SMQV-21 (EUT) measures approximately 5.8 cm (L) x 6.0 cm (W) x 1.6 cm (H) and weighs approximately 0.105 kg with two AA batteries.

The SMV-21 measures approximately 5.8 cm (L) x 4.6 cm (W) x 1.6 cm (H) and weighs approximately 0.0759 kg with one AA battery.

*The data gathered are from a typical production sample provided by the Lectrosonics, Inc. with serial number: 20645 & 7742*

## 1.3 Objective

The following type approved report is prepared on behalf of *Lectrosonics, Inc.* in accordance with Part 74, Subparts H of the Federal Communications Commission rules.

The objective is to determine compliance with Part 74 of the FCC Rules, limits for RF output power, Modulation characteristics, Emission bandwidth, Field strength of spurious radiation and Frequency stability for license-exempt, low-power radio apparatus operating in the television bands.

## 1.4 Related Submittal(s)/Grant(s)

N/A

## 1.5 Test Methodology

All measurements contained in this report were conducted in accordance with ANSI/TIA-603-E-2016, FCC KDB 971168 D01 Power Meas License Digital Systems v03r01, and EN 300 422-1 v1.4.2 Electromagnetic compatibility and Radio Spectrum Matters; Wireless microphones in the 25MHz to 3GHz frequency range.

All tests were performed at Bay Area Compliance Laboratories Corp.

## 1.6 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.

Based on CISPR16-4-2:2011, The Treatment of Uncertainty in EMC Measurements, the values ranging from ±2.0 dB for Conducted Emissions tests and ±4.0 dB for Radiated Emissions tests are the most accurate estimates pertaining to uncertainty of EMC measurements at BACL Corp.

## 1.7 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.

## 1.8 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 3279.02)*****,** 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***
- - 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 3279.01)*** 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: (Industry Canada - IC) 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 Development Authority - IDA) 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 EUT Test Configuration

## 2.1 Justification

The EUT was configured for testing according to ANSI/TIA-603-E-2016 and KDB 971168 D01 v03r01.

## 2.2 EUT Exercise Software

None

## 2.3 Special Equipment

There were no special accessories were required, included, or intended for use with EUT during these tests.

## 2.4 Equipment Modifications

No modifications were made to the EUT.

## 2.5 Local Support Equipment

None

## 2.6 Interface Ports and Cables

| Manufacturer | Model Number | Cable Description | Length (m) | From | To |
|---|---|---|---|---|---|
| Lectrosonics | MC35 | Microphone Adapter XLR with Cable | <1 | Audio Signal Generator | EUT |

# 3 Summary of Test Results

| FCC Rules | Descriptions of Test | Result (s) |
|---|---|---|
| FCC §2.1093 | RF exposure | Compliant[1] |
| FCC §74.861(e)(1) | RF output power | Compliant |
| FCC §74.861(e)(3) | Modulation characteristics | Compliant |
| FCC §74.861(e)(5)(7) | Operating bandwidth & Emission mask | Compliant |
| FCC §74.861(e)(7) | Spurious emissions at the antenna port | Compliant |
| FCC §74.861(e)(7) | Field strength of spurious emissions | Compliant |
| FCC §74.861(e)(4) | Frequency Tolerance | Compliant |

Note 1: Please refer to report R1807307-SAR

# 4 FCC §2.1093 - RF Exposure

Please refer to report R1807307-SAR for results.

# 5 FCC §74.861(e) (1) - RF Output Power

## 5.1 Applicable Standards

According to FCC §74.861 (e) (1): the power may not exceed the following values:

(i) 54-72, 76-88, and 174-216 MHz bands—50 mW EIRP
(ii) 470-608 and 614-698 MHz bands—250 mW Conducted power
(iii) 600 MHz duplex gap: 20 mW EIRP

## 5.2 Test Procedure

KDB 971168 D01 v03r01

## 5.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|
| Rohde & Schwarz | Signal Analyzer | FSQ26 | 200749 | 06/08/2017 | 2 years |
| - | 20dB attenuator | - | - | Each time[1] | N/A |

Note[1]: 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 A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

## 5.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22 ºC |
| **Relative Humidity:** | 45 % |
| **ATM Pressure:** | 101.2 kPa |

*The testing was performed by Chin Ming Lui on 2018-08-01 at RF site.*

## 5.5 Test Results

**SMV-21**

| Channel | Frequency (MHz) | Conducted Output Power (dBm) | Limits (dBm) | Rated Power (mW/dBm) |
|---|---|---|---|---|
| Low | 537.6 | 23.39 | 24 | 250/24 |
| | | 19.59 | 24 | 100/20 |
| | | 16.76 | 24 | 50/17 |
| Middle | 550.4 | 23.48 | 24 | 250/24 |
| | | 19.64 | 24 | 100/20 |
| | | 16.85 | 24 | 50/17 |
| High | 563.175 | 23.70 | 24 | 250/24 |
| | | 19.83 | 24 | 100/20 |
| | | 16.89 | 24 | 50/17 |

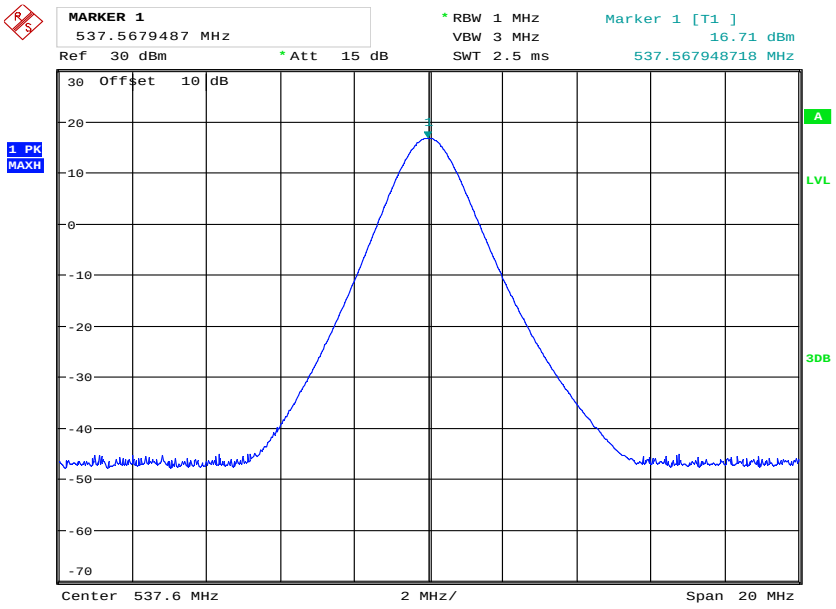
**SMQV-21**

| Channel | Frequency (MHz) | Conducted Output Power (dBm) | Limits (dBm) | Rated Power (mW/dBm) |
|---|---|---|---|---|
| Low | 537.6 | 23.26 | 24 | 250/24 |
| | | 19.34 | 24 | 100/20 |
| | | 16.48 | 24 | 50/17 |
| Middle | 550.4 | 23.28 | 24 | 250/24 |
| | | 19.39 | 24 | 100/20 |
| | | 16.60 | 24 | 50/17 |
| High | 563.175 | 23.38 | 24 | 250/24 |
| | | 19.66 | 24 | 100/20 |
| | | 16.92 | 24 | 50/17 |

Please refer to the following plots.

**SMV-21**

SMV-21 537.60 MHz 50 mW Output Power

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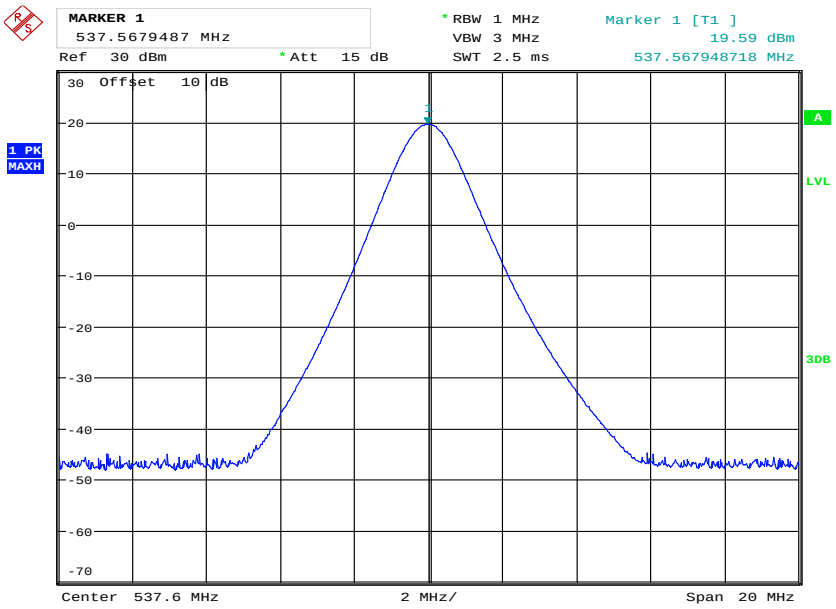
SMV-21 537.60 MHz 100 mW Output Power

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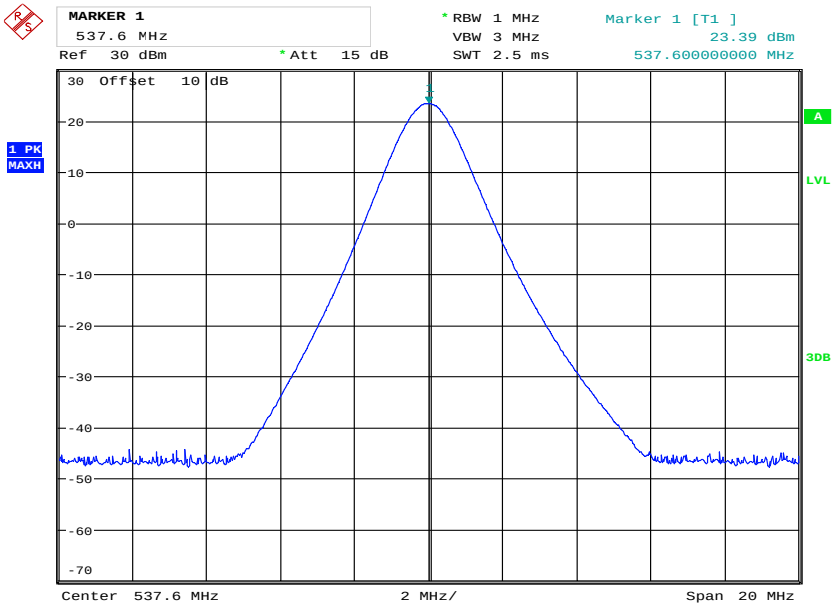
SMV-21 537.60 MHz 250 mW Output Power

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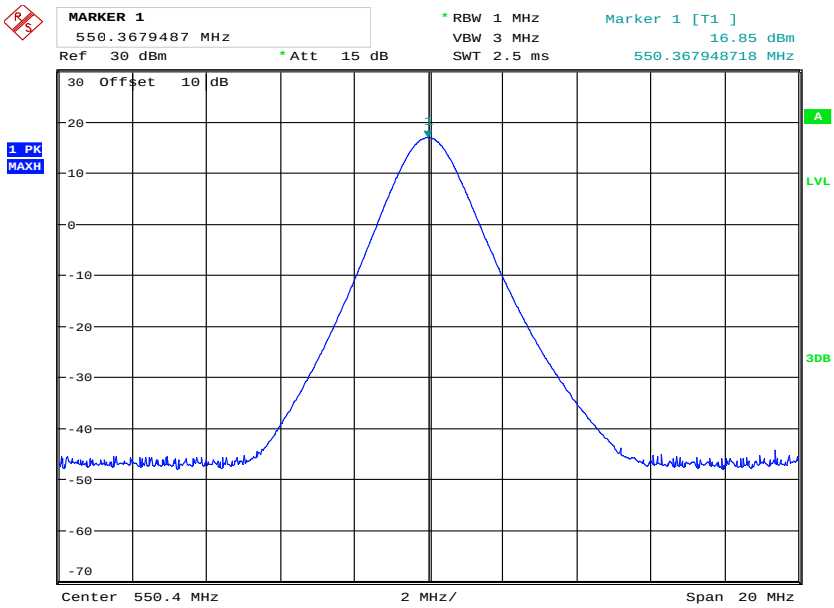
SMV-21 550.40 MHz 50 mW Output Power

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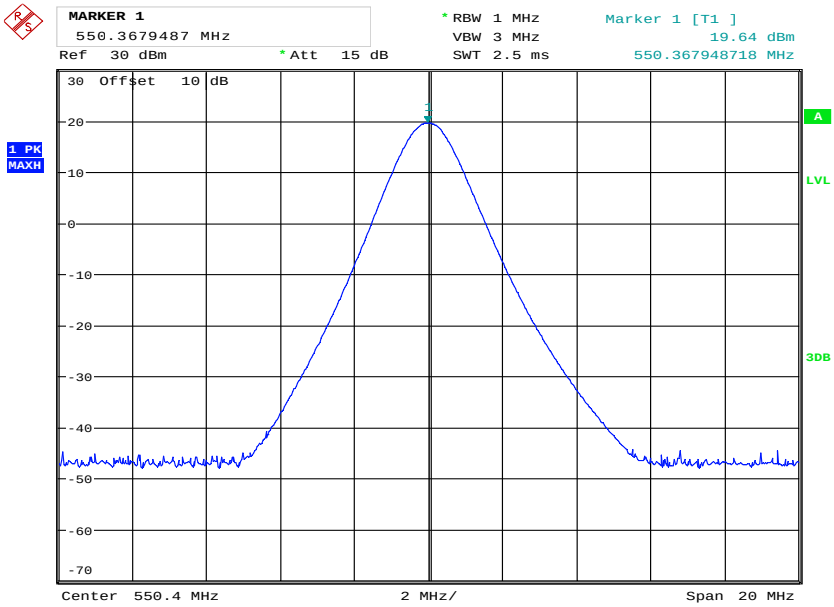


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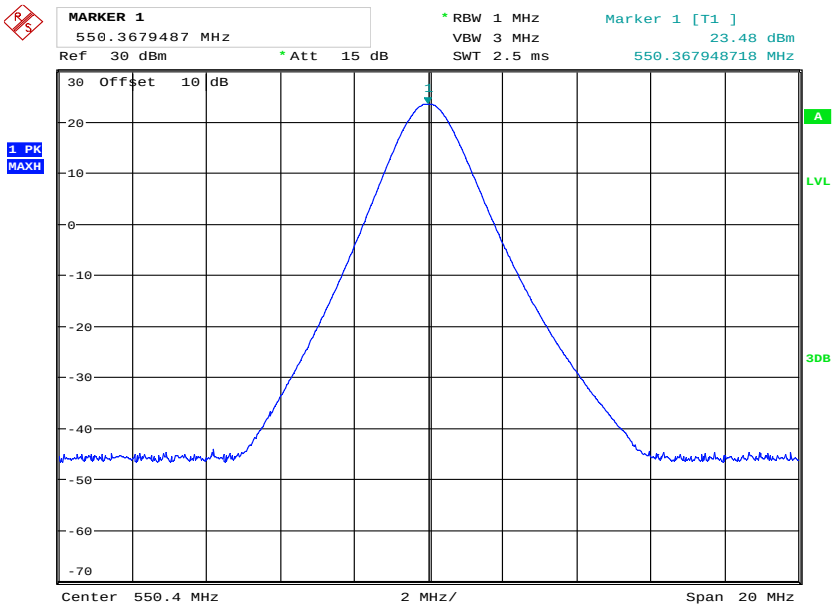
SMV-21 550.40 MHz 250 mW Output Power

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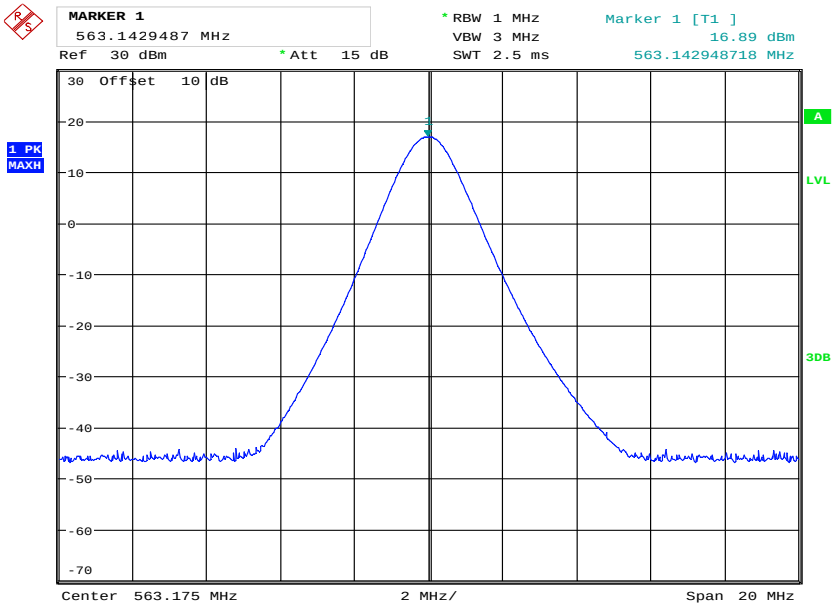
## SMV-21 563.175 MHz 50 mW Output Power

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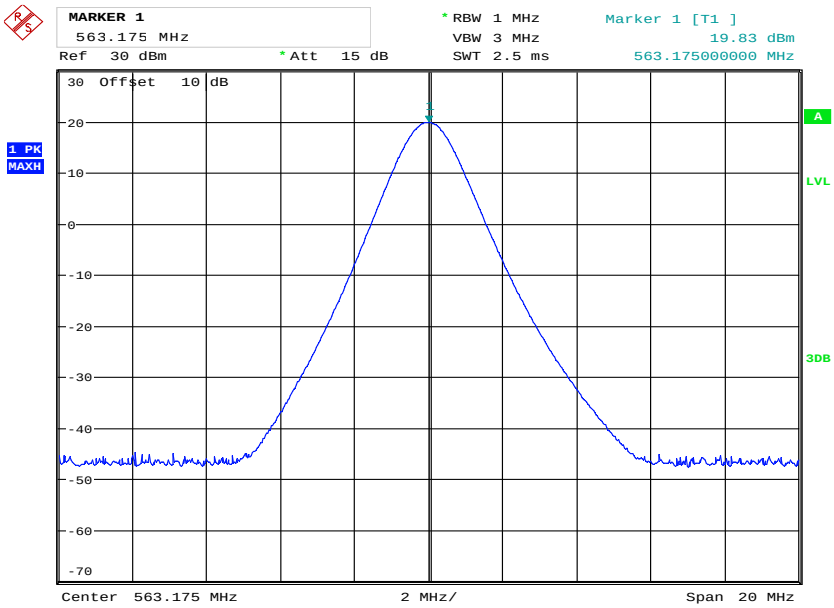
## SMV-21 563.175 MHz 100 mW Output Power

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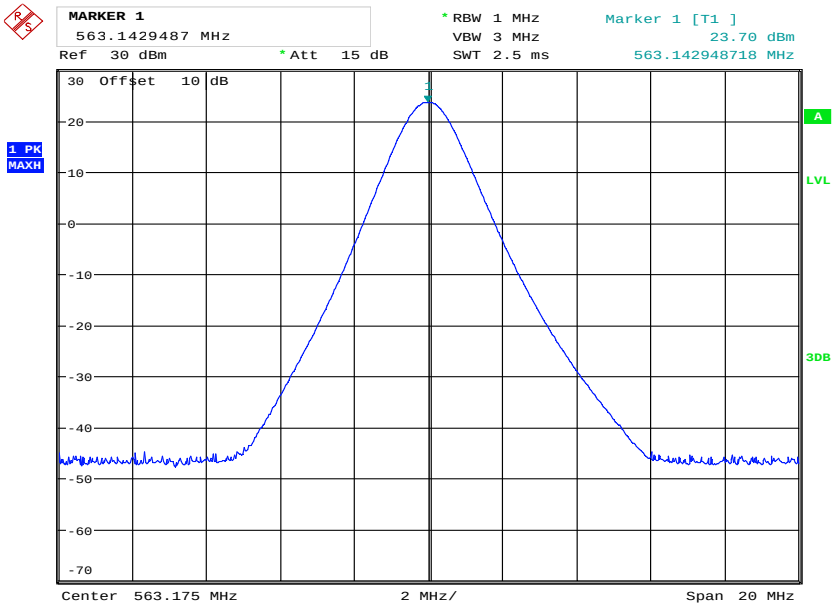
SMV-21 563.175 MHz 250 mW Output Power

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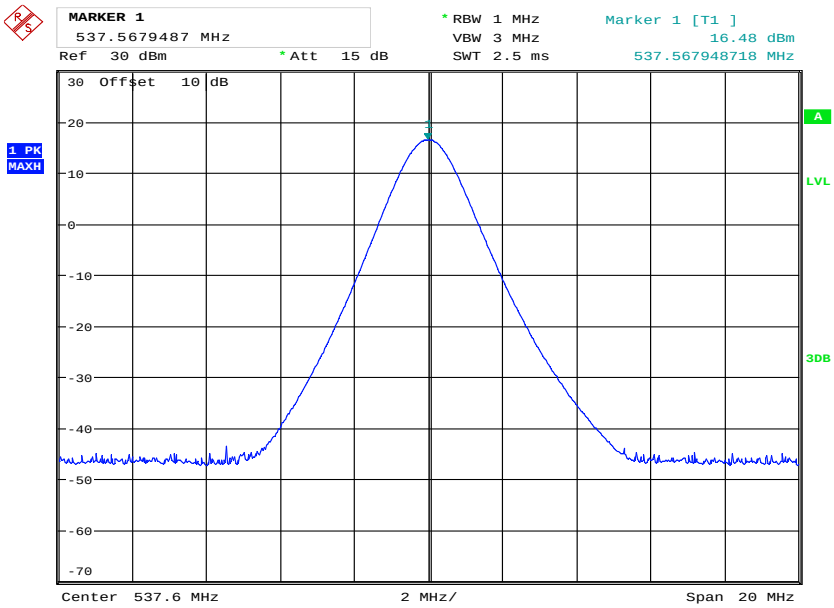
**SMQV-21**

SMQV-21 537.60 MHz 50 mW Output Power

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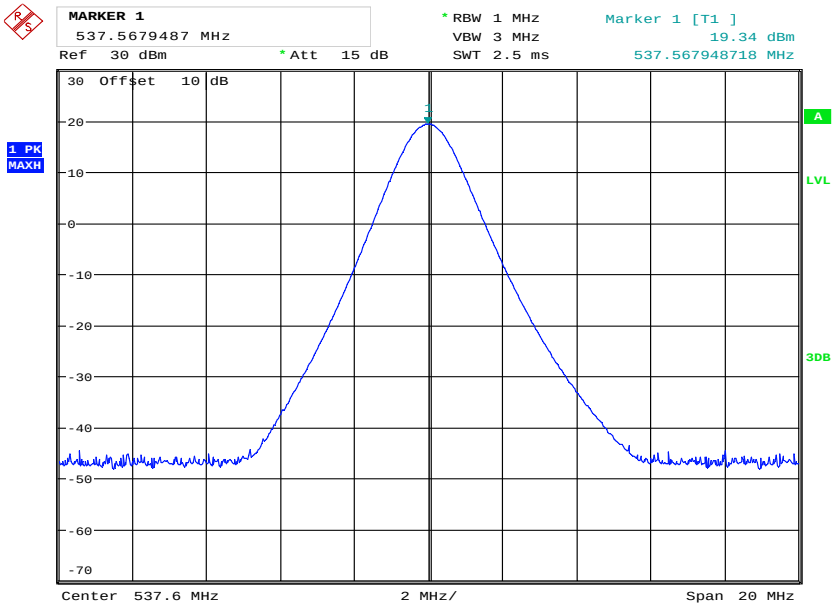
SMQV-21 537.60 MHz 100 mW Output Power

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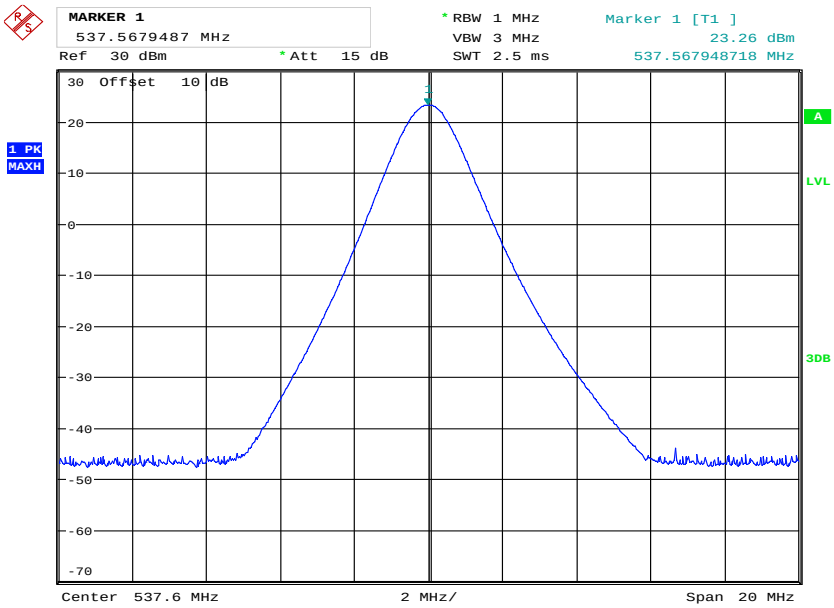
SMQV-21 537.60 MHz 250 mW Output Power

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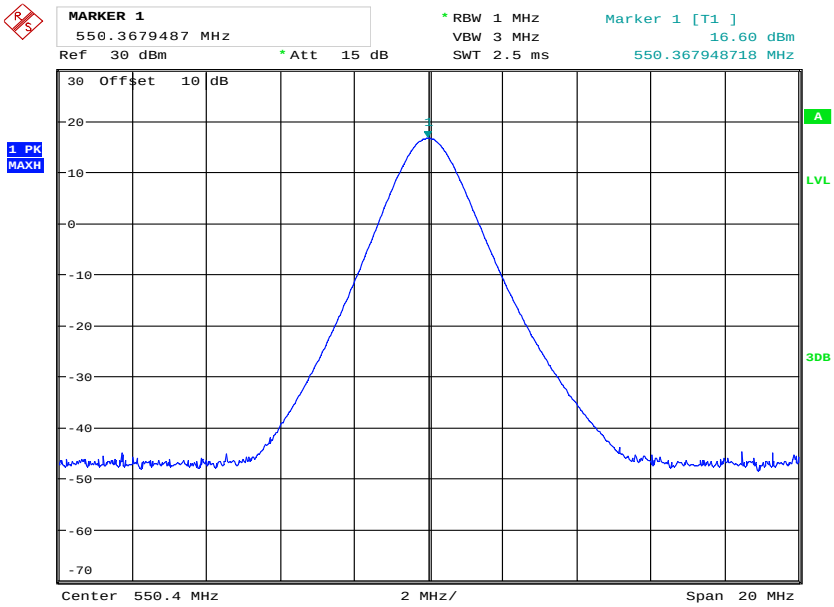
SMQV-21 550.40 MHz 50 mW Output Power

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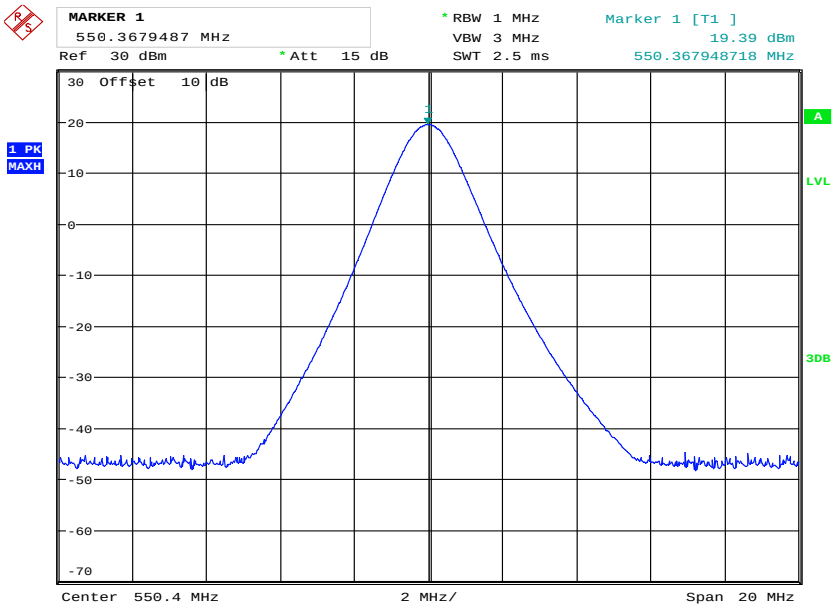
SMQV-21 550.40 MHz 100 mW Output Power

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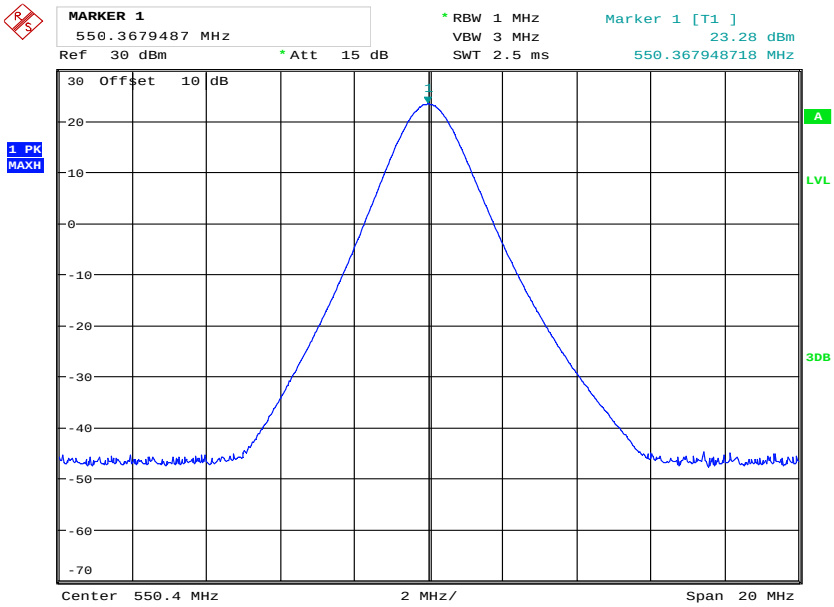
## SMQV-21 550.40 MHz 250 mW Output Power

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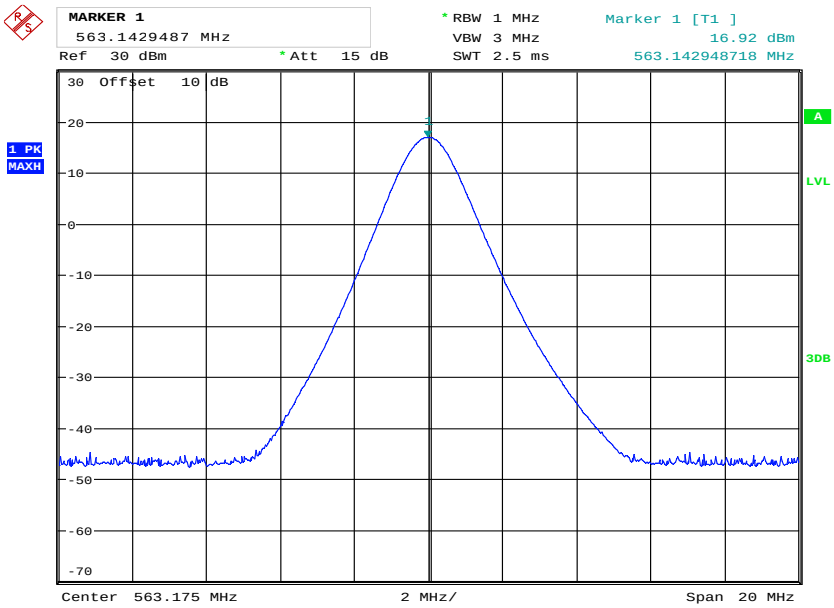
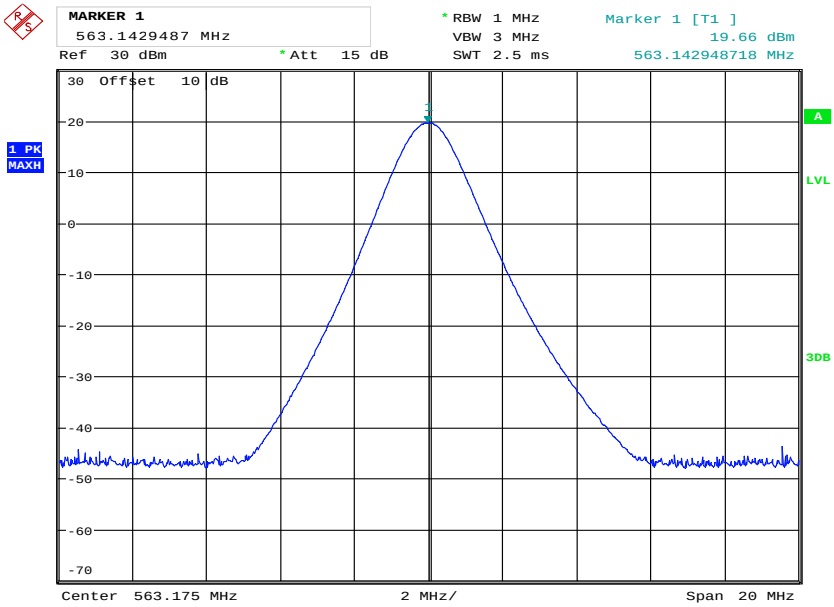
## SMQV-21 563.175 MHz 50 mW Output Power



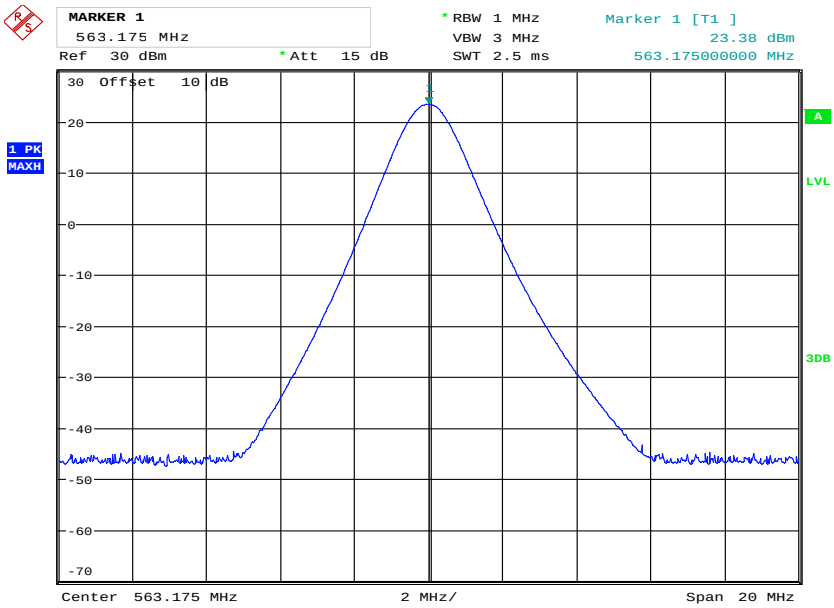

Date: 1.AUG.2018 19:58:01

SMQV-21 563.175 MHz 100 mW Output Power




Date: 1.AUG.2018 19:57:12

SMQV-21 563.175 MHz 250 mW Output Power




Date: 1.AUG.2018 19:56:08

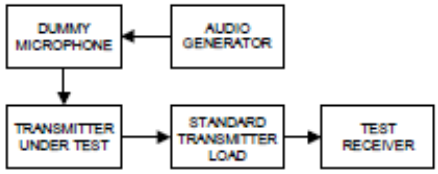
# 6 FCC §74.861 (e) (3) - Modulation Characteristics

## 6.1 Applicable Standards

According to FCC §74.861 (e)

(3) Any form of modulation may be used. A maximum deviation of ±75 kHz is permitted when frequency modulation is employed.

## 6.2 Test Procedure




a) Connect the equipment as illustrated.

b) Adjust the transmitter per the manufacturer's procedure for full rated system deviation.

c) Set the test receiver to measure peak positive deviation. Set the audio bandwidth for ≤0.25 Hz to ≥15,000 Hz. Turn the de-emphasis function off.

d) Apply a 1000 Hz modulating signal to the transmitter from the audio frequency generator, and adjust the level to obtain 60% of full rated system deviation.

e) Increase the level from the audio frequency generator by 20 dB in one step (rise time between the 10% and 90% points shall be 0.1 second maximum).

f) Measure both the instantaneous and steady-state deviation at and after the time of increasing the audio input level.

g) With the level from the audio frequency generator held constant at the level obtained in step e), slowly vary the audio frequency from 300 Hz to 3000 Hz and observe the steady-state deviation. Record the maximum deviation.

h) Set the test receiver to measure peak negative deviation and repeat steps d) through g).

i) The values recorded in steps g) and h) are the modulation limiting.

## 6.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|
| HP | Analyzer, RF Communications Test Set | 8920A | 3438A05338 | 01/09/2018 | 2 years |
| HP | Analyzer, Modulation | 8901A | 2026A00847 | 01/06/2018 | 2 years |
| - | RF Cable | - | - | - | Each time |

Note: Cable and attenuator included in the test set-up were 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 A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

## 6.4 Test Environmental Conditions

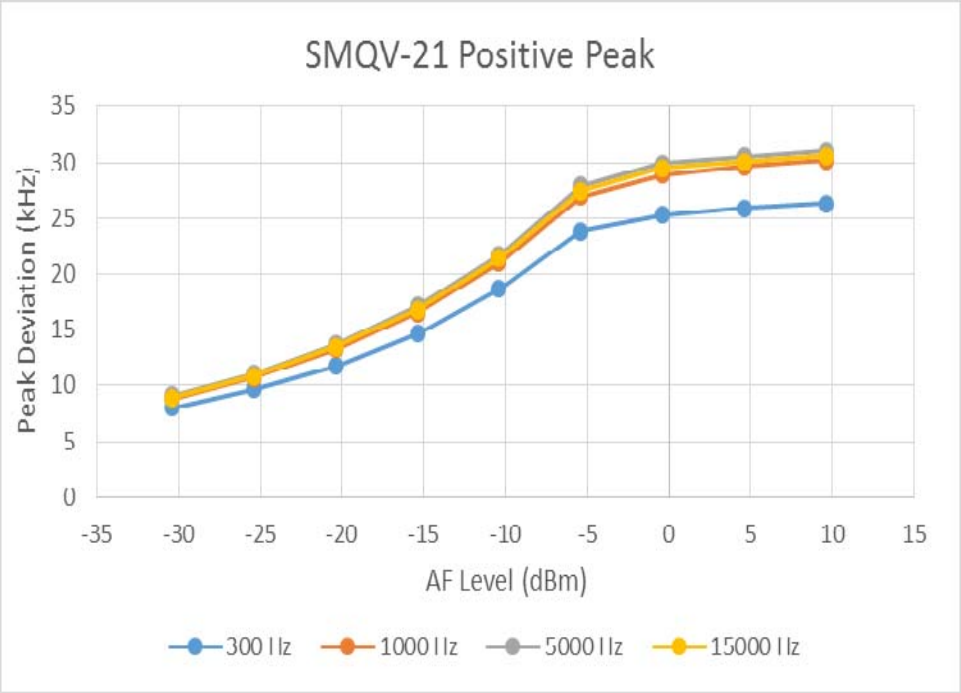
| | |
|---|---|
| **Temperature:** | 23 ºC |
| **Relative Humidity:** | 46 % |
| **ATM Pressure:** | 101.4 kPa |

*The testing was performed by Chin Ming Lui from 2018-08-16 to 2018-08-17 at RF site.*

## 6.5 Test Results

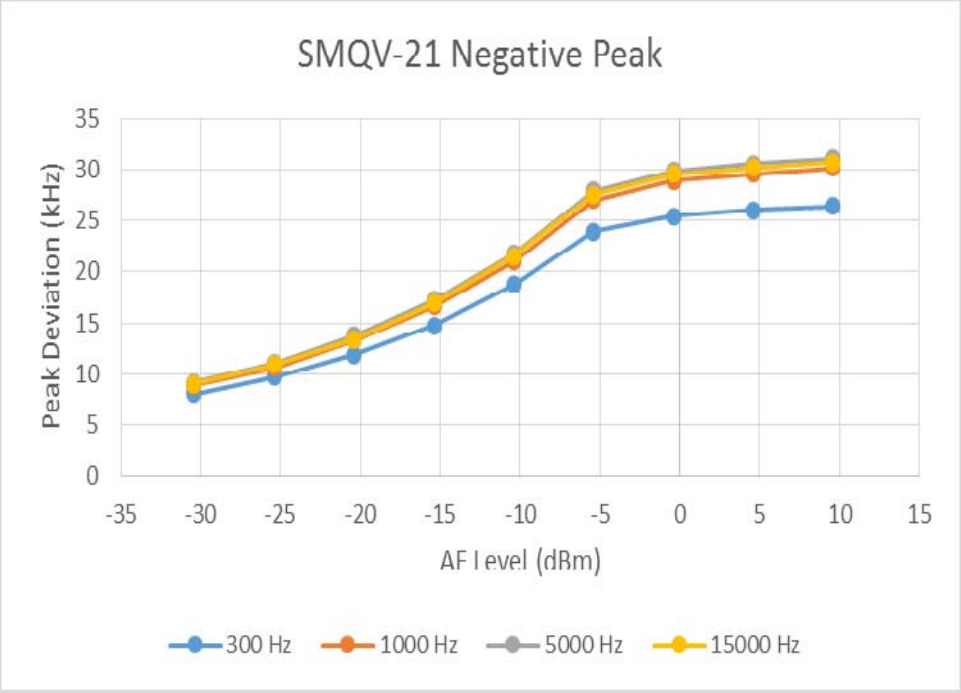
Deviation versus Audio input level and Audio Frequency Positive Peak

| AF Level (dBm) | AF Frequency (Hz)/Peak Deviation (kHz) | | | | Limit (kHz) |
|---|---|---|---|---|---|
| | 300 Hz | 1000 Hz | 5000 Hz | 15000 Hz | |
| -30.4 | 8.05 | 8.86 | 9.1 | 8.92 | ±75 |
| -25.4 | 9.68 | 10.73 | 11.04 | 10.86 | ±75 |
| -20.4 | 11.74 | 13.27 | 13.68 | 13.46 | ±75 |
| -15.4 | 14.68 | 16.54 | 17.16 | 16.81 | ±75 |
| -10.4 | 18.65 | 21.02 | 21.72 | 21.42 | ±75 |
| -5.4 | 23.84 | 26.95 | 27.93 | 27.45 | ±75 |
| -0.4 | 25.26 | 28.86 | 29.91 | 29.47 | ±75 |
| 4.6 | 25.93 | 29.63 | 30.57 | 30.05 | ±75 |
| 9.6 | 26.31 | 30.19 | 31.04 | 30.64 | ±75 |



Deviation versus Audio input level and Audio Frequency Negative Peak

| AF Level (dBm) | AF Frequency (Hz)/Peak Deviation (kHz) | | | | Limit (kHz) |
|---|---|---|---|---|---|
| | 300 Hz | 1000 Hz | 5000 Hz | 15000 Hz | |
| -30.4 | 8.03 | 8.86 | 9.17 | 9.03 | ±75 |
| -25.4 | 9.72 | 10.63 | 11.07 | 10.94 | ±75 |
| -20.4 | 11.87 | 13.31 | 13.75 | 13.43 | ±75 |
| -15.4 | 14.76 | 16.64 | 17.26 | 16.92 | ±75 |
| -10.4 | 18.75 | 21.01 | 21.74 | 21.54 | ±75 |
| -5.4 | 23.93 | 27.02 | 27.96 | 27.53 | ±75 |
| -0.4 | 25.46 | 28.94 | 29.91 | 29.55 | ±75 |
| 4.6 | 26.05 | 29.58 | 30.57 | 30.22 | ±75 |
| 9.6 | 26.45 | 30.22 | 31.12 | 30.75 | ±75 |



Audio Frequency Response, Middle Channel

| AF Frequency (Hz) | AF Level (mV) | AF Response (dB) |
|---|---|---|
| 100 | 18.5 | 2.7 |
| 200 | 16.0 | 1.5 |
| 300 | 17.0 | 2.0 |
| 400 | 15.0 | 0.9 |
| 500 | 12.0 | -1.0 |
| 600 | 11.5 | -1.4 |
| 700 | 12.0 | -1.0 |
| 800 | 14.0 | 0.3 |
| 900 | 14.0 | 0.3 |
| 1000 | 13.5 | 0.0 |
| 1200 | 11.5 | -1.4 |
| 1400 | 11.5 | -1.4 |
| 1600 | 13.0 | -0.3 |
| 1800 | 13.0 | -0.3 |
| 2000 | 12.0 | -1.0 |
| 2200 | 12.5 | -0.7 |
| 2400 | 12.5 | -0.7 |
| 2600 | 12.5 | -0.7 |
| 2800 | 12.0 | -1.0 |
| 3000 | 12.5 | -0.7 |
| 3250 | 12.5 | -0.7 |
| 3500 | 12.0 | -1.0 |
| 3750 | 12.0 | -1.0 |
| 4000 | 12.0 | -1.0 |
| 4250 | 12.0 | -1.0 |
| 4500 | 12.5 | -0.7 |
| 4750 | 12.5 | -0.7 |
| 5000 | 12.5 | -0.7 |

Note: AF Response = 20*log (AF Level/AF Level of 1 kHz)

# 7 FCC §74.861(e) (5) (7) - Occupied Bandwidth & Emission Mask

## 7.1 Applicable Standards

According to FCC §74.861 (e) (5) (7):

The operating bandwidth shall not exceed 200 kHz.

Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08). The requirements of this paragraph (e)(7) shall not apply to applications for certification of equipment in these bands until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in §73.3700(a)(2) of this chapter.

## 7.2 Test Procedure

The OBW is according to KDB 971168 D01 v03r01

The Emission mask is according to sections 8.3 of ETSI EN 300 422-1 V1.4.2 (2011-08).

## 7.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|
| Rohde & Schwarz | Spectrum Analyzer | FSQ26 | 200749 | 2017-06-08 | 2 years |
| HP | RF Communications Test Set | 8920A | 3438A05338 | 2018-01-09 | 2 years |
| HP | Modulation Analyzer | 8901A | 2026A00847 | 2018-01-06 | 2 years |
| Krohn-Hite | Active Dual Channel Filter | 3940 | 3212 | 2017-09-06 | 1 year |
| Agilent | Function Generator | 33220A | MY43004878 | 2018-01-09 | 1 year |
| HP | TIMS | 4934A | 3737U15141 | 2018-01-09 | 1 year |
| - | 10dB attenuator | - | - | Each time[1] | N/A |

Note[1]: 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 A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

## 7.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22 ºC |
| **Relative Humidity:** | 45 % |
| **ATM Pressure:** | 101.2 kPa |

*The testing was performed by Vincent Licata on 2018-08-20 and 2018-08-28 at RF site.*

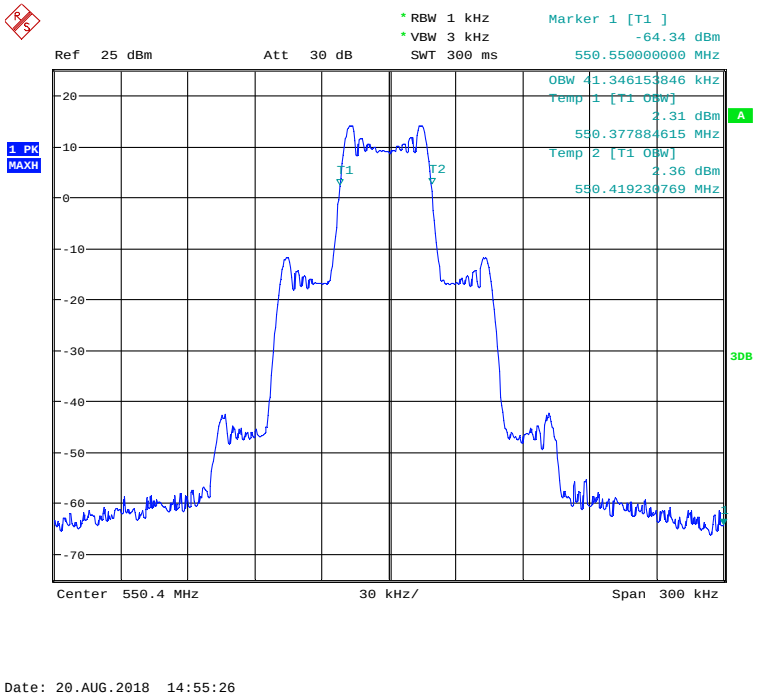
## 7.5 Test Results

| Center Frequency (MHz) | 99% Bandwidth (kHz) | Limit (kHz) | Power Setting | Result |
|---|---|---|---|---|
| 550.4 | 41.3462 | 200 | 250 mW (High) | Pass |
| 550.4 | 40.8654 | 200 | 50 mW (Low) | Pass |

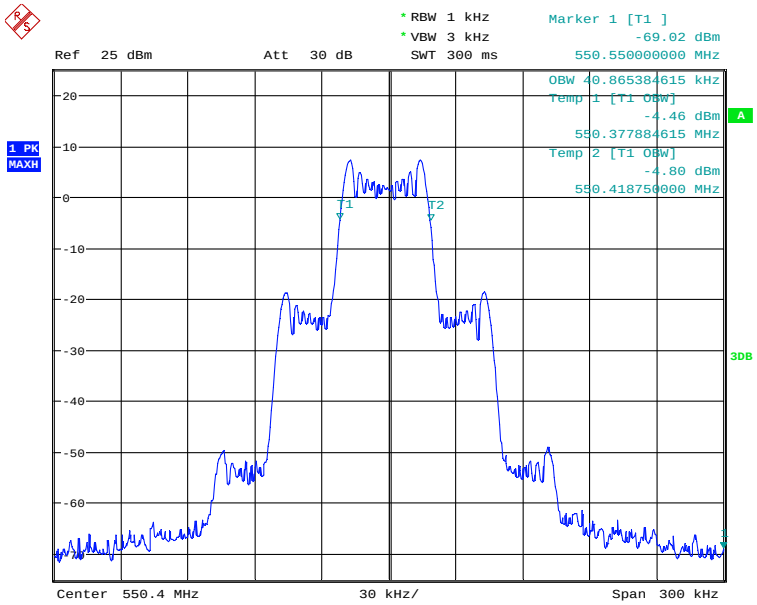
*Please refer to the following plots for detailed test results*

Occupied Bandwidth

**(250 mW power setting)**



**(50 mW power setting)**

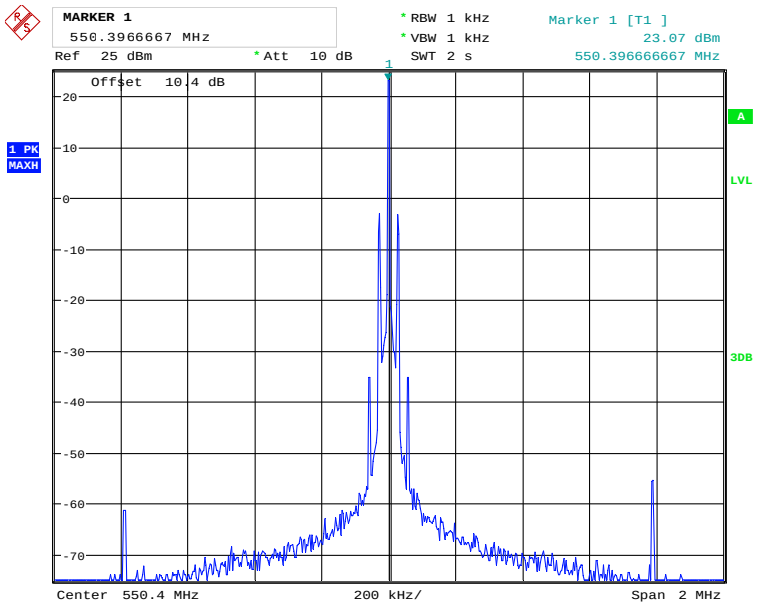



Date: 20.AUG.2018 14:56:17

Emission Mask

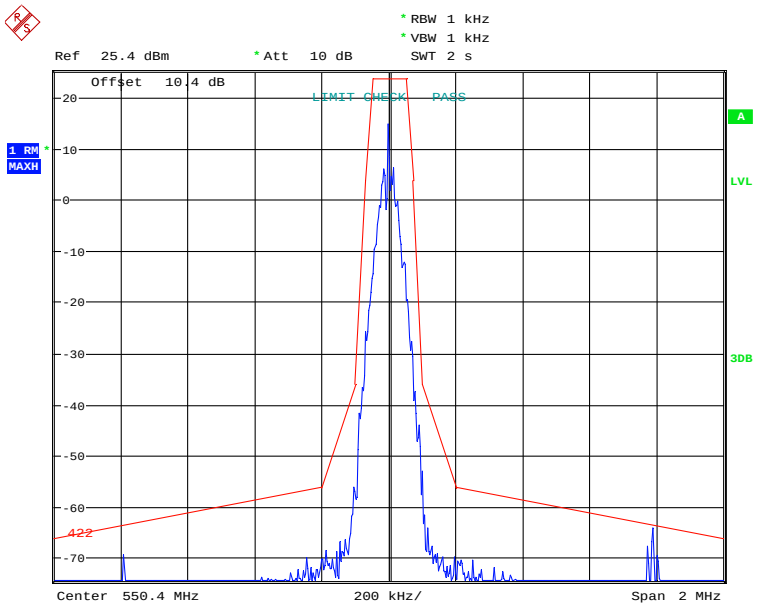
**(250 mW power setting)**

Reference Level




Date: 28.AUG.2018 11:08:15

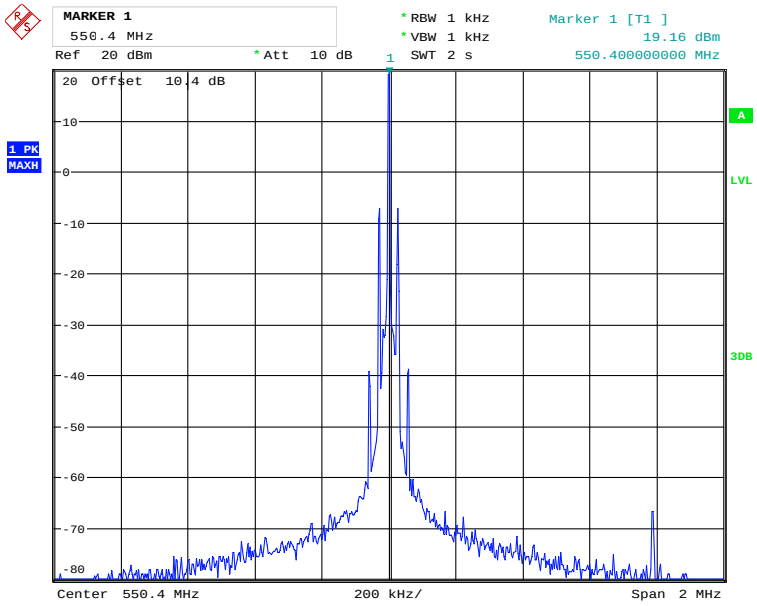
Emission Mask




Date: 28.AUG.2018 11:18:13

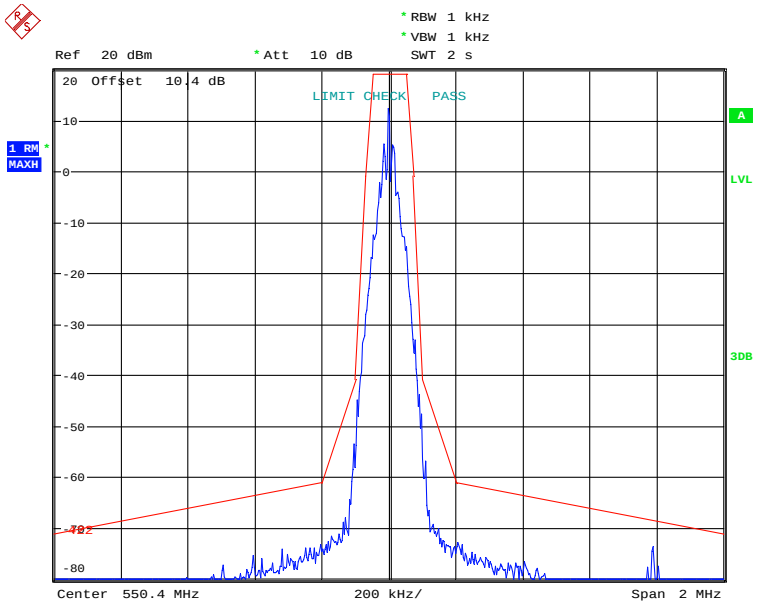
**(100 mW power setting)**

Reference Level




Date: 28.AUG.2018 11:19:59

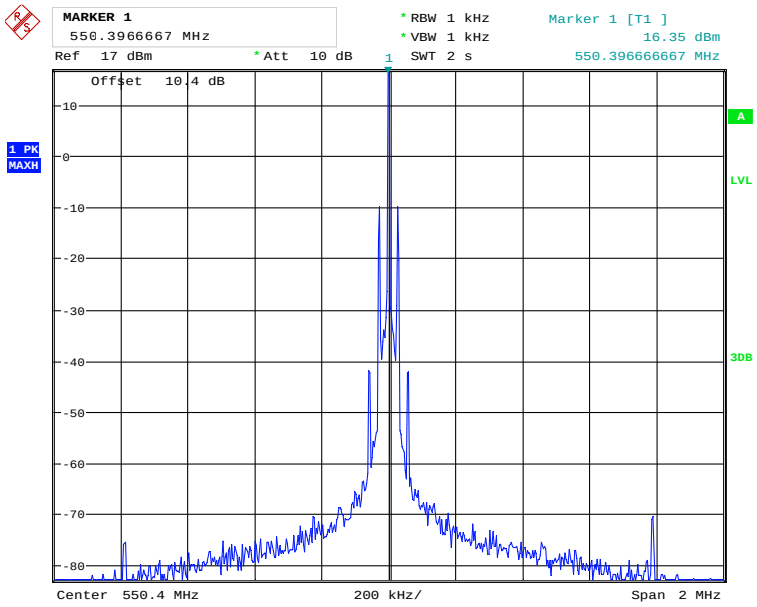
Emission Mask




Date: 28.AUG.2018 11:20:59

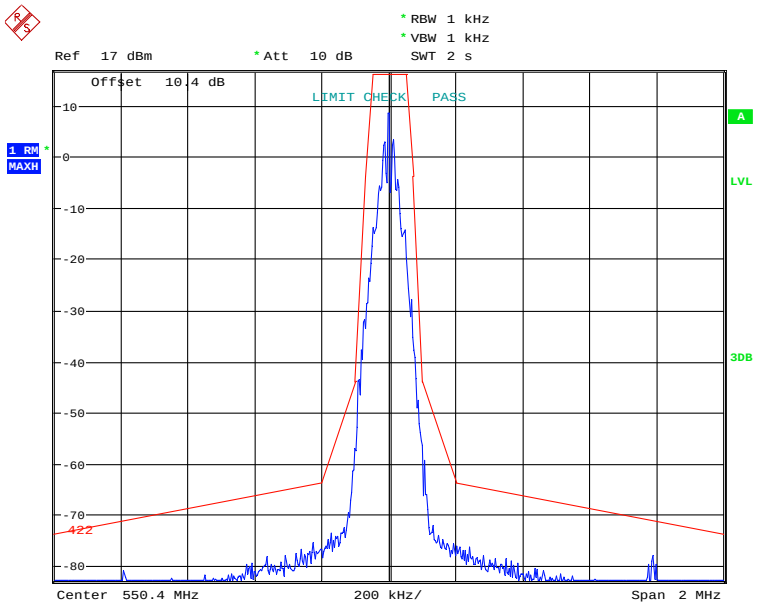
**(50 mW power setting)**

Reference Level




Date: 28.AUG.2018 11:22:21

Emission Mask




Date: 28.AUG.2018 11:28:26

# 8 FCC §74.861(e) (7) - Conducted Spurious Emissions at Antenna Port

## 8.1 Applicable Standards

According to FCC §74.861 (e) (7):

Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08). The requirements of this paragraph (e)(7) shall not apply to applications for certification of equipment in these bands until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in §73.3700(a)(2) of this chapter.

## 8.2 Test Procedure

KDB 971168 D01 v03r01 and ETSI EN 300 422-1 V1.4.2 (2011-08).

## 8.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|
| Rhode & Schwarz | Signal Analyzer | FSV40 | 1321.3008K39-101203-UW | 07/23/2018 | 1 year |
| - | 20dB attenuator | - | - | Each time[1] | N/A |

Note[1]: 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 A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

## 8.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22 ºC |
| **Relative Humidity:** | 45 % |
| **ATM Pressure:** | 101.2 kPa |

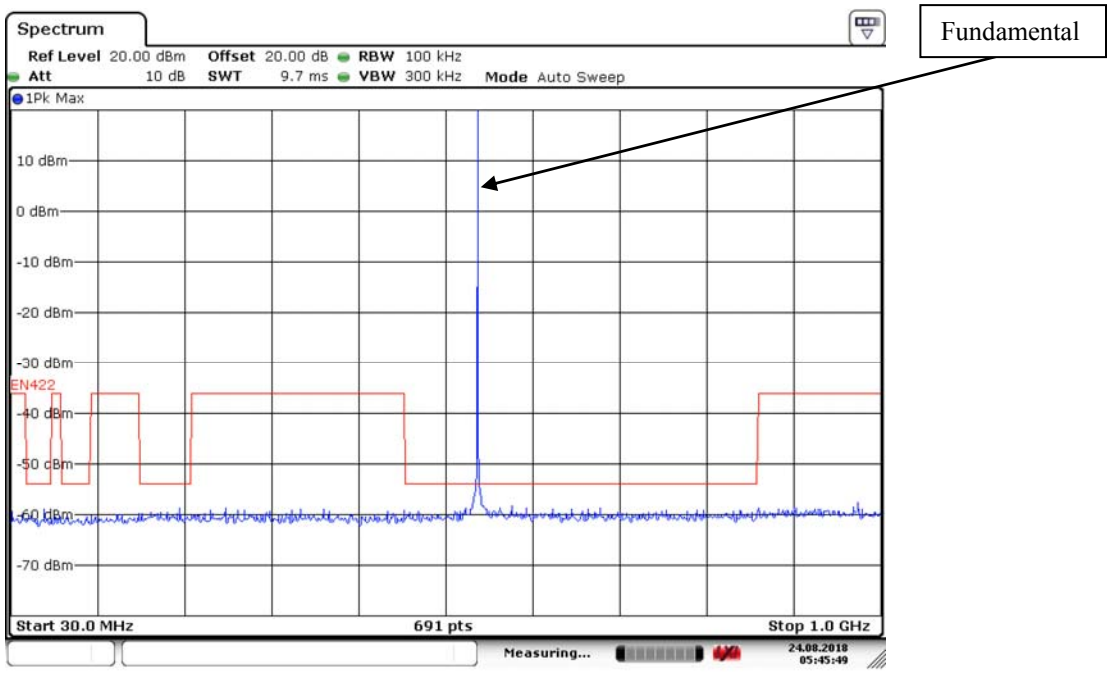
*The testing was performed by Vincent Licata on 2018-08-24 at RF site.*

## 8.5 Test Results

Please refer to the following table plots for detailed test results, testing was done at the highest power setting and limits from ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and radio spectrum matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement were used for worst case limits.

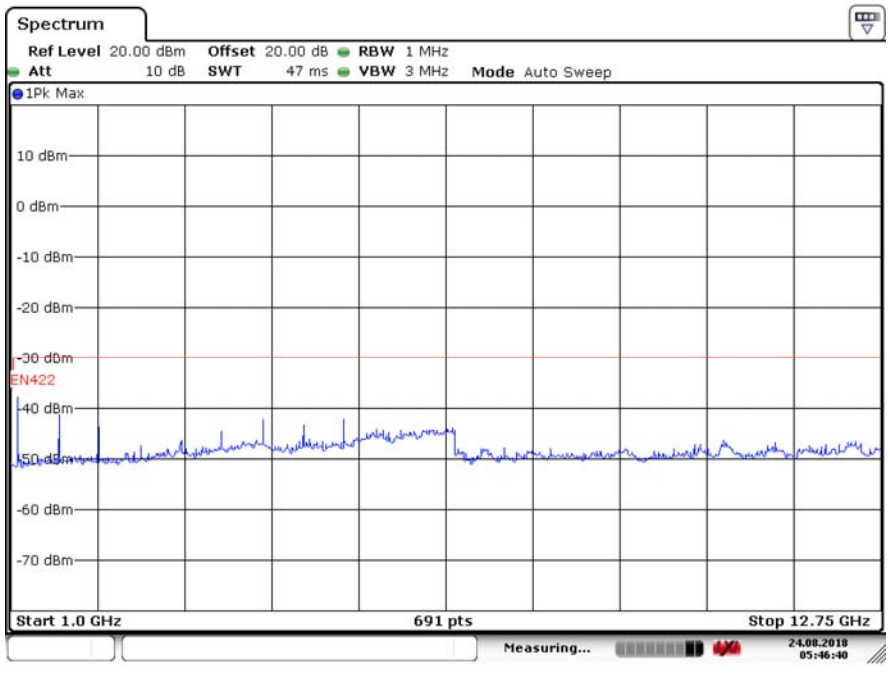
**Middle Channel: 550.4 MHz**

30 MHz to 1 GHz




Date: 24.AUG.2018 05:45:49

1 GHz to 12.75 GHz




Date: 24.AUG.2018 05:46:40

# 9 FCC §74.861(e) (7) - Field Strength of Spurious Radiation

## 9.1 Applicable Standards

According to FCC §74.861 (e) (7):

Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement. Digital emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.2.2 (Figure 4) of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement. Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08). The requirements of this paragraph (e)(7) shall not apply to applications for certification of equipment in these bands until nine months after release of the Commission's Channel Reassignment Public Notice, as defined in §73.3700(a)(2) of this chapter.

## 9.2 Test Procedure

KDB 971168 D01 v03r01 and ETSI EN 300 422-1 V1.4.2 (2011-08).

## 9.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4446A | MY48250238 | 2018-05-08 | 1 year |
| Sunol Science Corp | System Controller | SC99V | 011003-1 | N/R | N/A |
| Sunol Sciences | Biconi-Log Antenna | JB1 | A013105-3 | 2018-02-26 | 2 years |
| Agilent | Pre Amplifier | 8447D | 2944A10187 | 2018-04-02 | 1 year |
| HP | Pre-Amplifier | 8449B | 3147A00400 | 2018-02-02 | 1 year |
| Sunol Sciences | Horn Antenna | DRH-118 | A052704 | 2017-03-27 | 2 years |
| EMCO | Horn Antenna | 3115 | 9511-4627 | 2018-03-28 | 2 years |
| HP | Signal Generator | 83650B | 3614A00276 | 2017-11-06 | 1 year |
| - | RF Cable | - | - | Each time[1] | N/A |
| COM-POWER | Dipole Antenna | AD-100 | 721033DB1, 2, 3, 4 | 2017-2-13 | 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 A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

## 9.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 22 ºC |
| **Relative Humidity:** | 40 % |
| **ATM Pressure:** | 101.0 kPa |

*The testing was performed by Vincent Licata and Frank Wang from 2018-08-20 to 2018-08-22 at 5 meter chamber 3.*

## 9.5 Test Results

EUT was configured to the highest power setting on the worst case channel

TX Middle channel (550.4 MHz) at the maximum output power:

| 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 (dB) | Cable Loss (dB) | | | |
| 447 | 28.5 | 0 | 100 | H | 447 | -76.06 | 0 | 0.227 | -76.287 | -54 | -22.287 |
| 447 | 27.02 | 0 | 100 | V | 447 | -75.59 | 0 | 0.227 | -75.817 | -54 | -21.817 |
| 1100.8 | 49.91 | 0 | 100 | H | 1100.8 | -60.12 | 6.414 | 0.423 | -54.129 | -30 | -24.129 |
| 1651.2 | 51.84 | 0 | 135 | H | 1651.2 | -58.43 | 9.408 | 0.591 | -49.613 | -30 | -19.613 |
| 2201.6 | 57.71 | 0 | 100 | H | 2201.6 | -49.34 | 9.014 | 0.695 | -41.021 | -30 | -11.021 |
| 2752 | 53.56 | 0 | 100 | H | 2752 | -50.96 | 9.333 | 0.786 | -42.413 | -30 | -12.413 |
| 3302.4 | 59.69 | 0 | 121 | H | 3302.4 | -42.83 | 9.845 | 0.87 | -33.855 | -30 | -3.855 |
| 3852.8 | 56.6 | 0 | 176 | H | 3852.8 | -45.27 | 10.905 | 0.927 | -35.292 | -30 | -5.292 |
| 4403.2 | 58.27 | 0 | 118 | H | 4403.2 | -42.96 | 11.166 | 0.989 | -32.783 | -30 | -2.783 |
| 4953.6 | 54.06 | 0 | 116 | H | 4953.6 | -43.67 | 10.724 | 1.06 | -34.006 | -30 | -4.006 |
| 5504 | 55.65 | 0 | 100 | H | 5504 | -41.29 | 10.581 | 1.103 | -31.812 | -30 | -1.812 |
| 6054.4 | 48.04 | 0 | 100 | H | 6054.4 | -47.93 | 11.382 | 1.165 | -37.713 | -30 | -7.713 |
| 6604.8 | 49.75 | 0 | 199 | H | 6604.8 | -45.43 | 10.739 | 1.225 | -35.916 | -30 | -5.916 |

Note: Only Worst case antenna polarization was reported

Standby mode:

| 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 (dB) | Cable Loss (dB) | | | |
| 41 | 44.8 | 0 | 155 | V | 41 | -68.07 | 0 | 0.05 | -68.12 | -57 | -11.12 |
| 53 | 45.76 | 0 | 180 | H | 53 | -66.9 | 0 | 0.05 | -66.95 | -57 | -9.95 |
| 1276 | 48.33 | 0 | 100 | V | 1276 | -60.39 | 7.4 | 0.63 | -53.62 | -47 | -6.62 |
| 1276 | 47.98 | 0 | 100 | H | 1276 | -60.53 | 7.4 | 0.63 | -53.76 | -47 | -6.76 |

# 10 FCC §2.1055, §74.861(e) (4) - Frequency Stability

## 10.1 Applicable Standards

According to FCC §74.861 (e) (4):

The frequency tolerance of the transmitter shall be 0.005 percent

## 10.2 Test Procedure

According to FCC §2.1055,

(a) The frequency stability shall be measured with variation of ambient temperature as follows:
(1) From −30° to + 50° centigrade for all equipment except that specified in paragraphs (a) (2) and (3) of this section.

(b) Frequency measurements shall be made at the extremes of the specified temperature range and at intervals of not more than 10° centigrade through the range. A period of time sufficient to stabilize all of the components of the oscillator circuit at each temperature level shall be allowed prior to frequency measurement. The short term transient effects on the frequency of the transmitter due to keying (except for broadcast transmitters) and any heating element cycling normally occurring at each ambient temperature level also shall be shown. Only the portion or portions of the transmitter containing the frequency determining and stabilizing circuitry need be subjected to the temperature variation test.

(d) The frequency stability shall be measured with variation of primary supply voltage as follows:
(2) For hand carried, battery powered equipment, reduce primary supply voltage to the battery operating end point which shall be specified by the manufacturer.

## 10.3 Test Equipment List and Details

| Manufacturer | Description | Model | Serial Number | Calibration Date | Calibration Interval |
|---|---|---|---|---|---|
| Agilent | Spectrum Analyzer | E4446A | US44300386 | 2018-06-01 | 1 year |
| Tenney | Environmental Chamber | TUJR | 27445-06 | 2017-10-02 | 1 year |
| KEPCO | DC Source | 25-10M | H1334526 | Cal. Not Required | N/A |
| Fluke | Digital Multi-meter | 189 | 89920092 | 2018-03-22 | 1 year |
| - | 20dB attenuator | - | - | Each time[1] | N/A |
| - | 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 A2LA Policy P102 (dated 09 June 2016) "A2LA Policy on Metrological Traceability".*

## 10.4 Test Environmental Conditions

| | |
|---|---|
| **Temperature:** | 23 ºC |
| **Relative Humidity:** | 43 % |
| **ATM Pressure:** | 101.1 kPa |

*The testing was performed by Chin Ming Lui on 2018-08-06 and 2018-08-15 at RF site.*

## 10.5 Test Results

Varying temperature:

| Temperature (℃) | Measured Frequency (MHz) | Channel Frequency (MHz) | Frequency Tolerance (%) | Limits (%) |
|---|---|---|---|---|
| -30 | 550.4017 | 550.4 | 0.000308866 | 0.005 |
| -20 | 550.4042 | 550.4 | 0.000763081 | 0.005 |
| -10 | 550.4025 | 550.4 | 0.000454215 | 0.005 |
| 0 | 550.4025 | 550.4 | 0.000454215 | 0.005 |
| 10 | 550.4034 | 550.4 | 0.000617733 | 0.005 |
| 20 | 550.4008 | 550.4 | 0.000145349 | 0.005 |
| 30 | 550.3992 | 550.4 | -0.000145349 | 0.005 |
| 40 | 550.3966 | 550.4 | -0.000617733 | 0.005 |
| 50 | 550.3958 | 550.4 | -0.000763081 | 0.005 |

Varying supply voltage:

| Voltage | Measured Frequency (MHz) | Channel Frequency (MHz) | Frequency Tolerance (%) | Limits (%) |
|---|---|---|---|---|
| 2.55 V | 550.4000 | 550.4 | 0 | 0.005 |
| 3.45 V | 550.3992 | 550.4 | -0.000145349 | 0.005 |

# 11 Exhibit A - FCC Equipment Labeling Requirements

## 11.1 FCC ID Label Requirements

**As per FCC §2.925,**

(a) Each equipment covered in an application for equipment authorization shall bear a nameplate or label listing the following:

(1) FCC Identifier consisting of the two elements in the exact order specified in §2.926. The FCC Identifier shall be preceded by the term FCC ID in capital letters on a single line, and shall be of a type size large enough to be legible without the aid of magnification.

Example: FCC ID: XXX123

Where: XXX—Grantee Code, 123—Equipment Product Code

**As per FCC §15.19**,

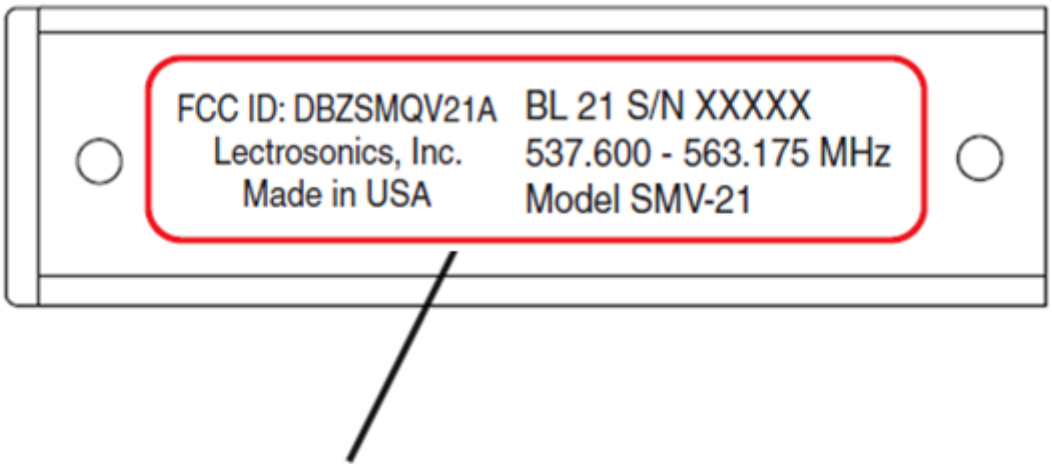
(a) In addition to the requirements in part 2 of this chapter, a device subject to certification, or verification shall be labeled as follows:

(3) All other devices shall bear the following statement in a conspicuous location on the device:
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

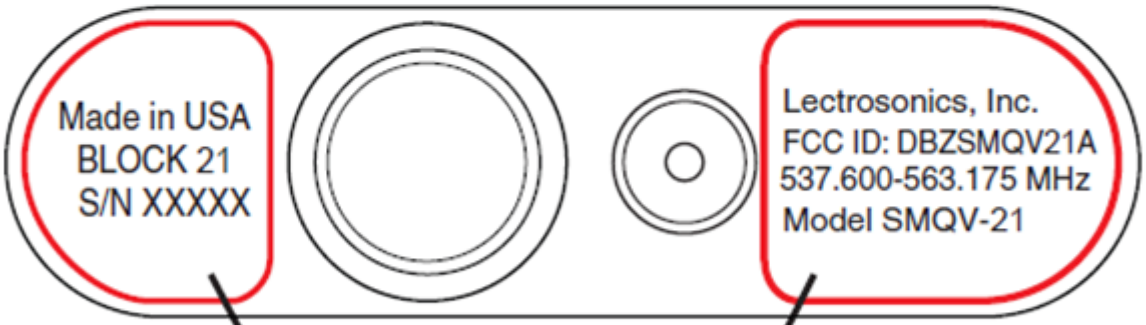
(4) Where a device is constructed in two or more sections connected by wires and marketed together, the statement specified above is required to be affixed only to the main control unit. If the EUT is integrated within another device then a label affixed to the host shall also state, "Contains FCC ID: XXXXXX"

(5) When the device is so small or for such use that it is not practicable to place the statement specified under paragraph (a) of this section on it, the information required by this paragraph shall be placed in a prominent location in the instruction manual or pamphlet supplied to the user or, alternatively, shall be placed on the container in which the device is marketed. However, the FCC identifier or the unique identifier, as appropriate, must be displayed on the device.

## 11.2 Label Contents and Location




Label location - actual size




Label locations - actual size

# 12 Exhibit B - EUT Photographs

Please see attachments:

Exhibit – EUT Test Setup Photographs
Exhibit – EUT External Photographs
Exhibit – EUT Internal Photographs

# 13 Exhibit C (Informative) - 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 17025:2005 *General requirements for the competence of testing and calibration laboratories*. This laboratory also meets the requirements of any additional program requirements in the Electrical field. 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 8 January 2009*).

Presented this 30th day of August 2016.

President and CEO
For the Accreditation Council
Certificate Number 3297.02
Valid to September 30, 2018
Revised November 14, 2016

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

**--- END OF REPORT ---**