



# SHURE

## ELECTROMAGNETIC COMPATIBILITY LABORATORY

### TEST REPORT

**TEST REPORT TITLE:** Electromagnetic Compatibility Tests of the Shure QLXD2 Digital Wireless Microphone Transmitter in the J50A Band (572MHz to 608MHz)

**TEST ITEM DESCRIPTION:**

The Shure QLXD2 is a digital wireless microphone transmitter.

**For:** Shure Incorporated  
5800 West Touhy Avenue  
Niles, IL 60714

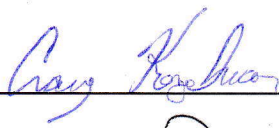
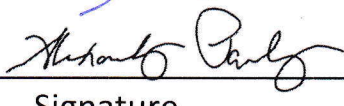
**Project ID Number:** SEL-041/QLXD2 J50A FCC74H

**Date Tested:** July 27 thru September 9, 2020 and November 9, 2020

**Test Personnel:** Sharjeel Sohail and Juan Castrejon

**Test Specification:**

FCC Part 74, Subpart H – Low Power Auxiliary Stations  
IC RSS-Gen – General Requirements and Information for the Certification of Radio Apparatus  
IC RSS-210 - License-exempt Radio Apparatus (All Frequency Bands): Category I Equipment

|                 |  |                                   |                          |
|-----------------|--|-----------------------------------|--------------------------|
| TEST REPORT BY: | <u></u> | <u>Global Compliance Engineer</u> | <u>November 23, 2020</u> |
| APPROVED BY:    | <u></u> | <u>Manager, Quality Labs</u>      | <u>November 23, 2020</u> |
|                 | Signature  | Position                          | Date                     |

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**LIST OF APPENDICIES**

| APPENDIX | TEST DESCRIPTION                            |
|----------|---|
| A        | Operating Bandwidth, 99% Emission Bandwidth |
| B        | Spurious Emissions                          |
| C        | Maximum Rated Power                         |



## **REPORT REVISION HISTORY**

| Revision | Date              | Description  |
|----------|-------------------|--|
| 0        | September 9, 2020 | Initial release  |
| 1        | November 10, 2020 | Added RSS-210, RSS-Gen 99% Emission Bandwidth.<br>Corrected EIRP calculations. |
| 2        | November 23, 2020 | Corrected Maximum Rated Power calculation on Page 39.                          |
|          |                   |  |
|          |                   |  |

## 1. INTRODUCTION

### 1.1. Scope of Tests

This report presents the results of testing per FCC Part 74H, Section 74.861(e)(1)(ii), Section 74.861(e)(5), Section 74.861(e)(7), FCC OET Basic Certification Requirements for Wireless Microphones, RSS-Gen, and RSS-210. The following data was taken following the measurement method as described in the document section(s) listed on page 1 of this document. Provided is the data for the test sample. Also included is a summary of the measurements made and a description of the measurement setup. The test samples meet the requirements of the above standards. The equipment under test (EUT) contained a transmitter that was designed to transmit in the UHF TV frequency bands shown in Table 1.

| Model | Band | Frequency (MHz) | Output Power (mW) |
|-------|------|-----------------|-------------------|
| QLXD2 | J50A | 572 to 608      | 1 and 10          |
| QLXD2 | J50  | 572 to 608      | 1 and 10          |

**Table 1. EUT Frequencies and Power Levels**

### 1.2. Purpose

This series of testing was performed to determine if the test item would meet the requirements of FCC Part 74H, Section 74.861(e)(1)(ii), Section 74.861(e)(5), Section 74.861(e)(7), the FCC OET Basic Certification Requirements for Wireless Microphones, RSS-Gen, and RSS-210.

### 1.3 Deviations, Additions and Exclusions

None

### 1.4 EMC Laboratory Identification

The electromagnetic compatibility tests were performed at the Shure Electromagnetic Laboratory, Shure Incorporated, 5800 West Touhy Ave, Niles, Illinois 60714-4608. This laboratory is registered with Industry Canada as Site # 616A-1. The Shure Electromagnetic Laboratory is accredited by the National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP).

The NVLAP Lab Code is: 200946-0.

### 1.5 Summary of Tests Performed

The following electromagnetic compatibility tests (Table 2) were performed on the test item in accordance with ETSI specifications.

**Table 2. Summary of tests performed**

| FCC Part 74H Test Spec | Description            | EUT Firmware | Tested Frequency in MHz   | Appendix | Test Results |
|------------------------|------------------------|--------------|---------------------------|----------|--------------|
| 74.861(e)(5)           | Operation Bandwidth    | 2.3.22       | 572.000, 589.925, 607.875 | A        | Pass         |
| RSS-210, RSS-Gen       | 99% Emission Bandwidth | 2.3.22       | 572.000, 589.925, 607.875 | A        | Pass         |
| 74.861(e)(7)           | Spurious Emissions     | 2.3.22       | 572.000, 589.925, 607.875 | B        | Pass         |
| 74.861(e)(1)(ii)       | Maximum Rated Power    | 2.3.22       | 572.000, 589.925, 607.875 | C        | Pass         |



## 2 APPLICABLE DOCUMENTS

The following documents of the exact issue designated form part of this document to the extent specified herein:

FCC Part 74H, Section 74.861(e)(1)(ii)

FCC Part 74H, Section 74.861(e)(5)

FCC Part 74H, Section 15.236(e)(7)

FCC Title 47, Chapter I, Subchapter A, Part 2 – Frequency Allocations and Radio Treaty Matters, General Rules and Regulations, Subpart J – Equipment Authorization Procedures

EN 300 422-1 V1.4.2 (2011-08), “Electromagnetic compatibility and Radio spectrum Matters (ERMM); Wireless Microphones in the 25 MHz to 3 GHz frequency range; Part 1: technical characteristics and methods of measurement”

ANSI C63.10 (2013), "American National Standard of Procedures for Compliance Testing of Unlicensed Wireless Devices”

“Federal Communications Commission  
Office of Engineering and Technology, Laboratory Division  
BASIC CERTIFICATION REQUIREMENTS FOR WIRELESS MICROPHONES”  
Dated December 13, 2017

RSS-Gen Issue 5, “General Requirements for Compliance of Radio Apparatus”

RSS-210 Issue 9, “Licence-Exempt Radio Apparatus: Category I Equipment”

### 3 EUT SET-UP AND OPERATION

#### 3.1. General Description

The test sample used was Shure QLXD2 digital wireless microphone transmitter. The EUT was arranged and tested per individual Appendices.

#### 3.2 Test Sample

The following product sample was tested:

**Table 3: Shure QLXD2 Digital Wireless Transmitter Sample**

| Band | Serial Numbers |
|------|----------------|
| J50A | 1 and N6       |

#### 3.3 Operational Mode

The transmit frequency and output power modes shown in the individual appendices.

### 4. Test Instrumentation

A list of the test equipment used can be found in Table 10-1. All equipment used was within calibration during and throughout the duration of the tests. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

### 5. Procedure

The specific test procedures are presented in the individual appendices.

### 6. Other Test Conditions:

#### 6.1. Test Personnel

All EMC tests were performed by qualified personnel from the Shure EMC Laboratory.

#### 6.2. Disposition of the EUT

The EUTs and all associated equipment were returned to Shure Incorporated upon completion of the tests.

### 7. Results of Tests:

The results are presented in Appendices. It was found that the EUT meets the requirements of FCC Part 74H, Section 74.861(e)(1)(ii), Section 74.861(e)(5), Section 74.861(e)(7), the FCC OET Basic Certification Requirements for Wireless Microphones, RSS-Gen, and RSS-210.



**8. Conclusions:**

It was determined that the Shure QLXD2 Digital Wireless Microphone Transmitter did fully comply with the requirements of FCC Part 74H, Section 74.861(e)(1)(ii), Section 74.861(e)(5), Section 74.861(e)(7), the FCC OET Basic Certification Requirements for Wireless Microphones, RSS-Gen, and RSS-210.

**9. Certification:**

Shure EMC Laboratory certifies that the information contained in this report was obtained under conditions which meet or exceed those specified in the test specifications.

The data presented in this test report pertains to the EUTs at the test date. Any electrical or mechanical modification made to the EUTs subsequent to the specified test date will serve to invalidate the data and void this certification.

This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST, or any agency of the U.S. Government.

## 10. Equipment List

| L# or ID   | Description                     | Manufacturer    | Model #               | Serial #  | Frequency Range | Cal Date   | Due Date   |
|------------|---------------------------------|-----------------|-----------------------|-----------|-----------------|------------|------------|
| L23-011-01 | 3-meter RF Chamber              | ETS Lindgren    | FACT-3                | AJ640     | 25MHz - 18GHz   | 5/23/2019  | 5/23/2021  |
| L23-011-02 | Electric Powered Turntable      | ETS Lindgren    | 2088                  | N/A       | N/A             | N/A        | N/A        |
| L23-011-08 | Controller                      | EMCO            | 2090                  | 29799     | N/A             | N/A        | N/A        |
| L23-011-09 | Antenna Positioner              | ETS Lindgren    | 2071-2                | 35500     | N/A             | N/A        | N/A        |
| L23-011-15 | BiConiLog Antenna               | ETS Lindgren    | 3142C                 | 34790     | 25MHz-1GHz      | 7/16/2019  | 7/16/2021  |
| L23-011-54 | EMI Test Receiver               | Rohde & Schwarz | ESR26                 | 100220    | 9kHz-26GHz      | 11/18/2019 | 11/18/2021 |
| L23-011-31 | EMI/EMS Test Software           | Rohde & Schwarz | EMC32                 | V 9.21.00 | N/A             | N/A        | N/A        |
| L23-011-53 | Horn antenna with pre-amplifier | ETS Lindgren    | 3117-PA               | 200363    | 1GHz to 18 GHz  | 9/17/2019  | 9/17/2021  |
| L23-011-41 | Horn Antenna                    | ETS Lindgren    | 3117                  | 123511    | 1GHz to 18 GHz  | 1/23/2019  | 1/23/2021  |
| L23-011-56 | High Pass Filter                | K&L             | 11SH10-940/X10000-0/0 | 2         | 940MHz – 10GHz  | 3/3/2020   | 3/3/2022   |
| L23-022-02 | Spectrum Analyzer               | Rohde & Schwarz | FSW26                 | 103788    | 9kHz-26GHz      | 3/4/2020   | 3/4/2022   |
| L23-022-01 | Spectrum Analyzer               | Rohde & Schwarz | FSU26                 | 201043    | 9kHz-26GHz      | 8/23/2017  | 8/14/2021  |
| L23-034-02 | Temperature Hygrometer          | Extech          | 445703                | 48254-65  | N/A             | 5/1/2020   | 5/1/2022   |
| L23-034-04 | Temperature Hygrometer          | Extech          | 445703                | 48254-13  | N/A             | 5/1/2020   | 5/1/2022   |
| L23-040-03 | 20dB Attenuator                 | MCL             | BW-N20W5+             | N/A       | 20MHz to 18GHz  | 3/2/2020   | 3/2/2022   |
| L23-045-36 | RF Power Sensor                 | ETS-Lindgren    | 7002-006              | 151071    | 10MHz to 6GHz   | 1/10/2020  | 1/10/2022  |
| L23-023-01 | RF Signal Generator             | Rohde & Schwarz | SMF100A               | 101553    | 20Hz to 26.5GHz | 8/14/2019  | 8/14/2021  |

**Table 10-1 Test Equipment**

## Appendix A

### OPERATING BANDWIDTH

#### PURPOSE

This test was performed to determine if the EUT meets the operating bandwidth requirements of FCC Part 74 Section 74.861(e)(5) and EN 300 422-1, section 8.3.2., with the EUT operating at 572.000MHz, 589.925MHz, and 607.875MHz.

The testing results show the EUT meets FCC 74H Section 74.861(e)(5) and RSS-210, operating bandwidth does not exceed 200kHz.

#### REQUIREMENTS

As stated in FCC 74H Section 74.861(e)(5), operating bandwidth shall not exceed 200kHz, and EN 300 422-1, section 8.3.2, the emission mask given in section 8.3.2.2 shall not be exceeded.

#### TEST SETUP AND INSTRUMENTATION

A photograph of the test setup is shown in Figure A-1. The test instrumentation can be determined from Table 10-1.

#### MEASUREMENT UNCERTAINTY

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system. Values of Expanded Measurement Uncertainty (95% Confidence):

| Measurement Type    | $U_{LAB}$      |
|---------------------|----------------|
| Operating Bandwidth | $\pm 0.130 \%$ |

$U_{lab}$  = Determined for Shure EMC Laboratory

Since  $U_{LAB}$  is less than or equal to  $U_{ETSI}$ :

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;
- Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

#### EUT OPERATION

A Shure KSM8 microphone head was used. The EUT was powered up and the transmit frequency and power output of the EUT were selected. The EUT was checked for proper operation after it was setup for the test. Testing was conducted with the EUT set to transmit at 572.000MHz, 589.925MHz, and 607.875MHz, at an output power level of 1mW and 10mW. The transmitter was modulated per EN300422-1 V1.4.2 (2011-08), clause 7.1.2.

## Appendix A

### TEST PROCEDURE

The test procedure followed is shown in EN300422-1 V1.4.2 (2011-08), section 8.3.2.

### RESULTS

The necessary bandwidth data is presented on pages 12 thru 20. Data is shown on the figures for each transmitter. The figure shows the maximum relative level within the emission mask with modulation. As shown by the test data, the necessary bandwidth of the EUT meets the requirements of EN 300 422-1, section 8.3.3.1. The RSS-Gen maximum ISD Canada 99% bandwidth measurement was less than 200 kHz.

The temperature during the testing was 74 degrees F, with relative humidity of 17%.

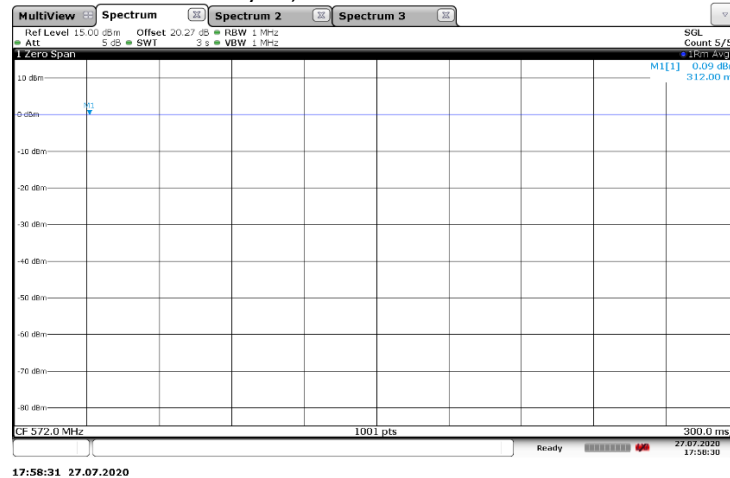


**Figure A-1 - Test Setup for Necessary Bandwidth**

## Appendix A

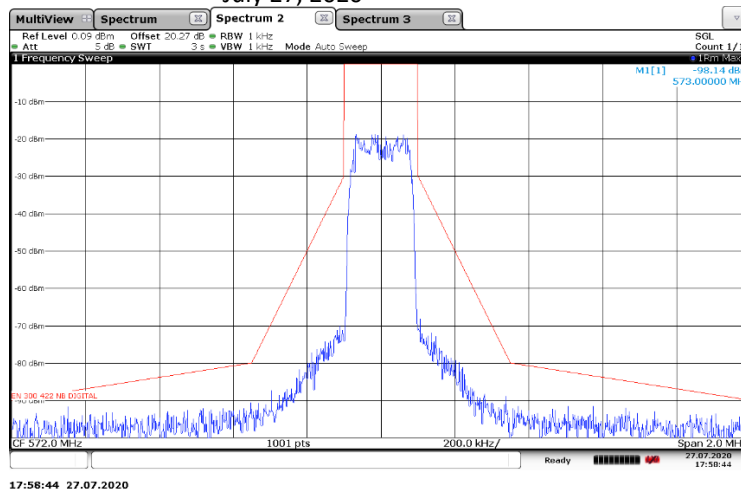
### Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Low Frequency, 572.000MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 1; Carrier Power  
 Date Tested: July 27, 2020



### Test Information

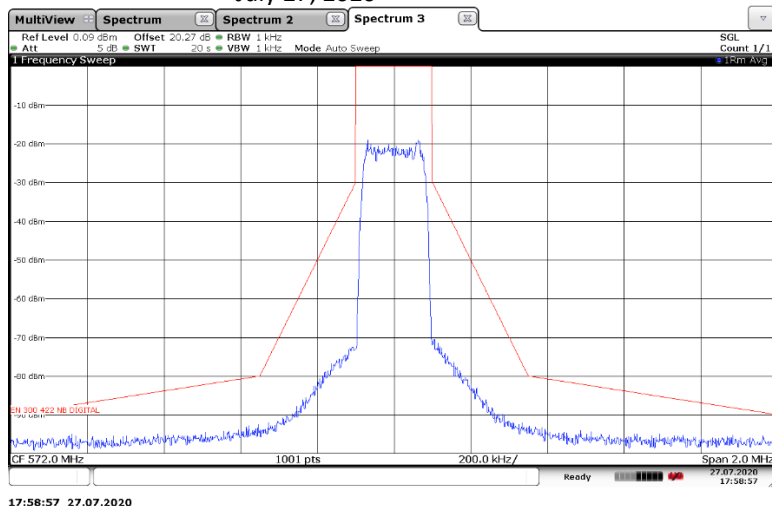
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 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 2; Maximum Relative Level  
 Date Tested: July 27, 2020



## Appendix A

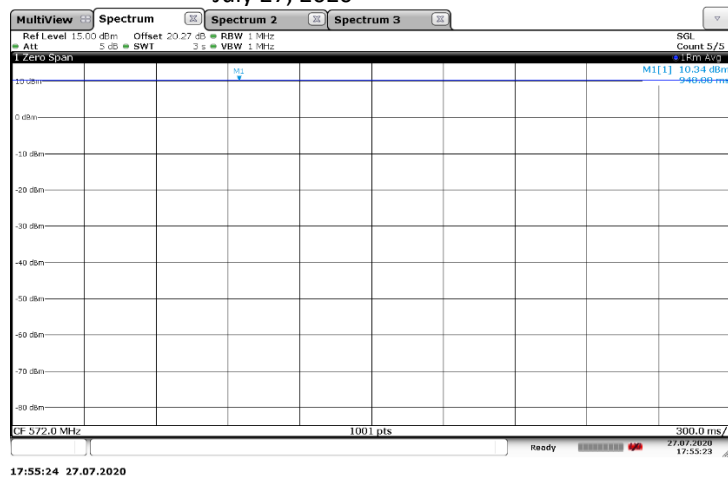
### Test Information

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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Low Frequency, 572.000MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 3; Lower and upper frequency transmitter band  
 Wide band noise floor  
 Date Tested: July 27, 2020



### Test Information

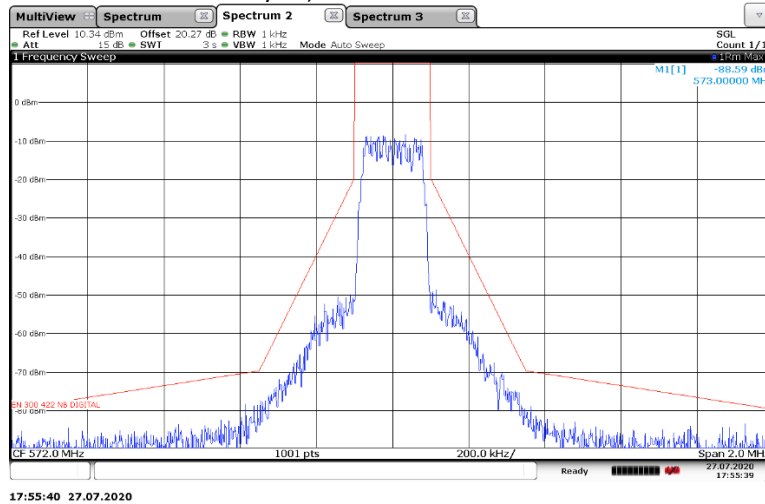
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 Serial Number: N6  
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 Operating Conditions: Low Frequency, 572.000MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 1; Carrier Power  
 Date Tested: July 27, 2020



## Appendix A

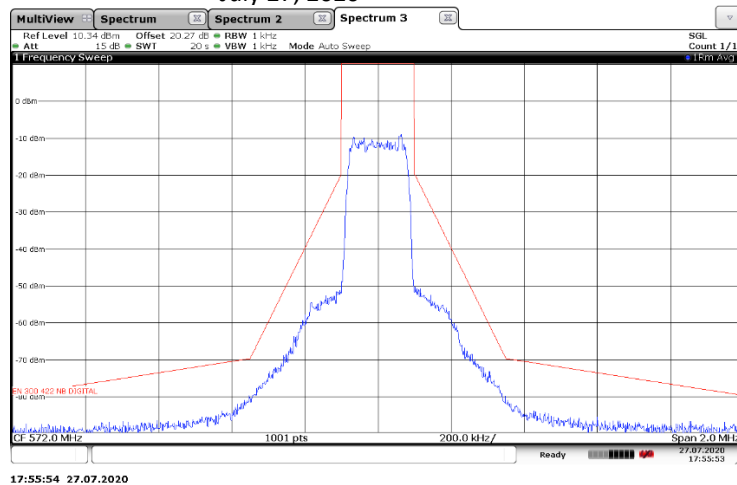
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EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Low Frequency, 572.000MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 2; Maximum Relative Level  
 Date Tested: July 27, 2020



### Test Information

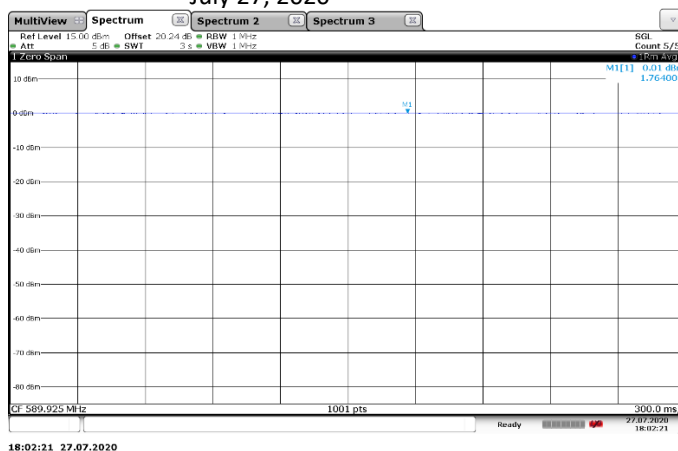
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 Operating Conditions: Low Frequency, 572.000MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 3; Lower and upper frequency transmitter band  
 Wide band noise floor  
 Date Tested: July 27, 2020



## Appendix A

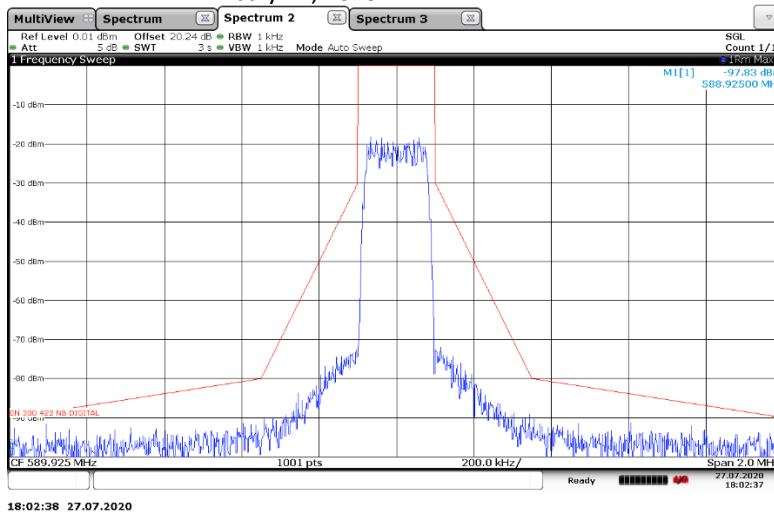
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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Middle Frequency, 589.925MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 1; Carrier Power  
 Date Tested: July 27, 2020



### Test Information

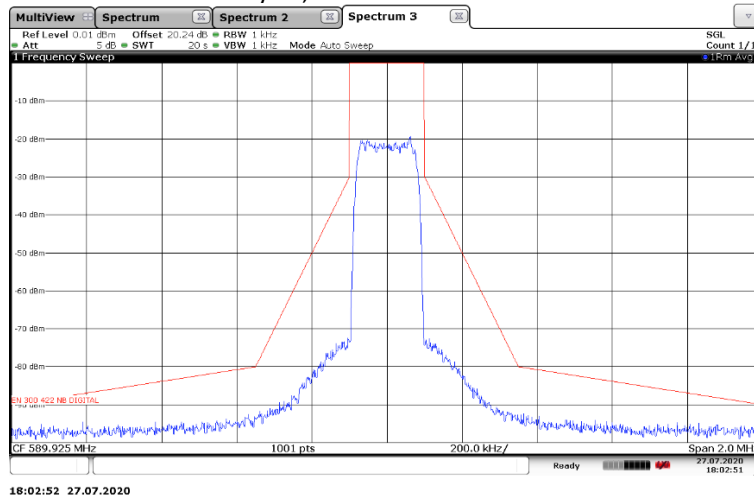
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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Middle Frequency, 589.925MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 2; Maximum Relative Level  
 Date Tested: July 27, 2020



## Appendix A

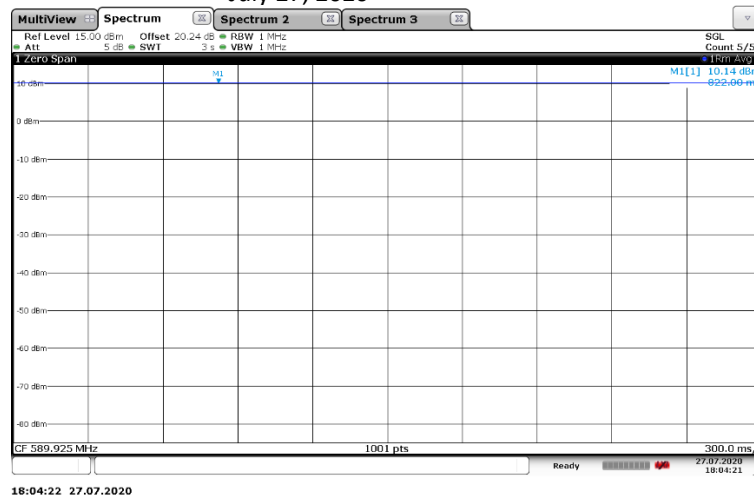
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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Middle Frequency, 589.925MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 3; Lower and upper frequency transmitter band  
 Wide band noise floor  
 Date Tested: July 27, 2020



### Test Information

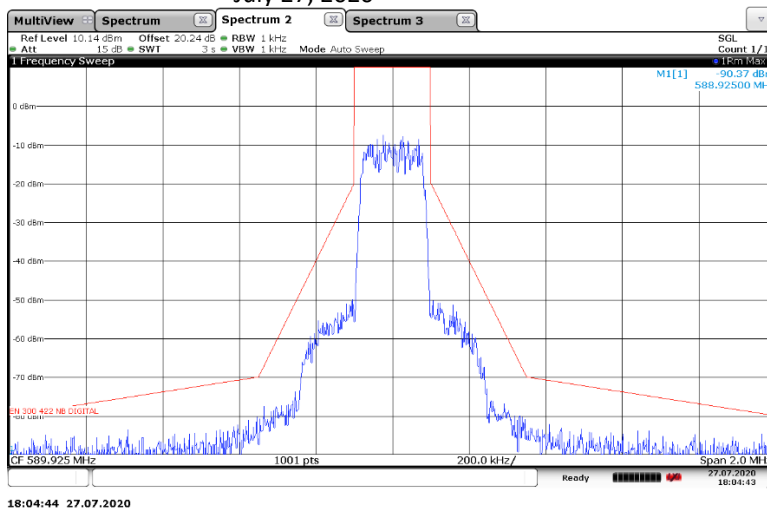
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 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 1; Carrier Power  
 Date Tested: July 27, 2020



## Appendix A

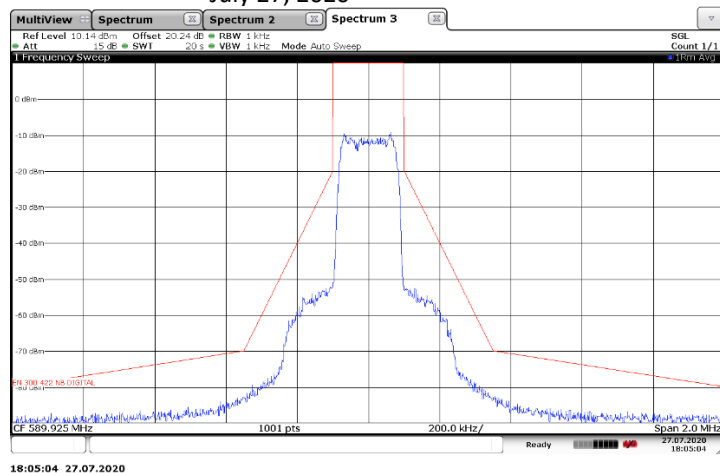
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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Middle Frequency, 589.925MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 2; Maximum Relative Level  
 Date Tested: July 27, 2020



### Test Information

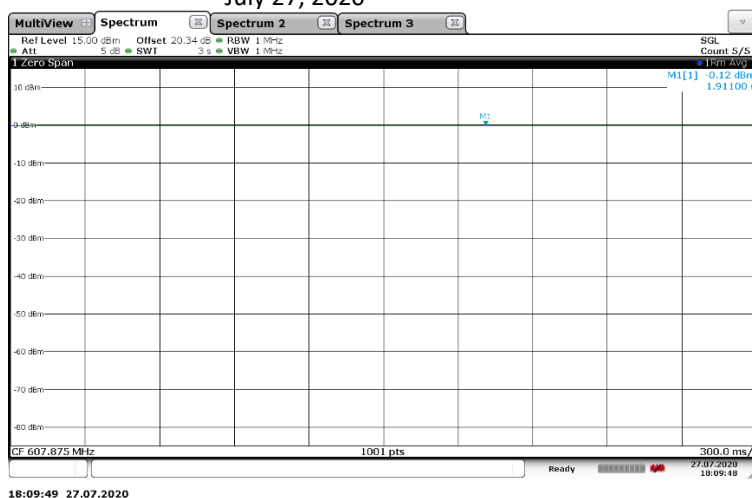
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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: Middle Frequency, 589.925MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 3; Lower and upper frequency transmitter band  
 Wide band noise floor  
 Date Tested: July 27, 2020



## Appendix A

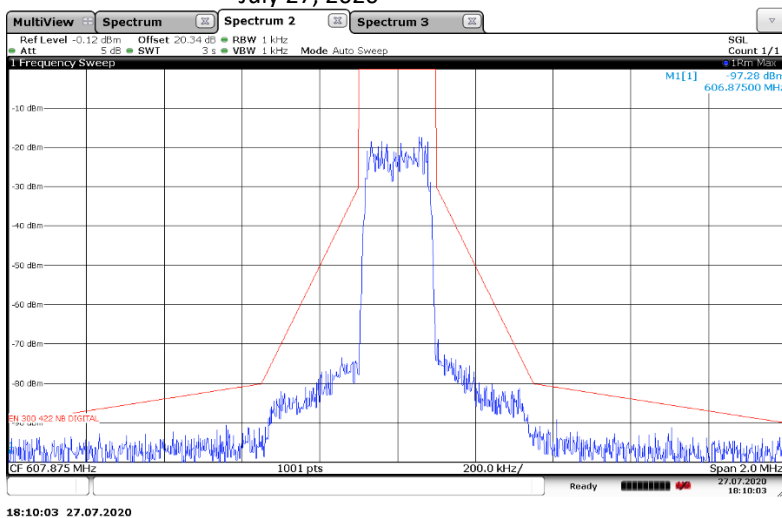
### Test Information

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 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: High Frequency, 607.875MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 1; Carrier Power  
 Date Tested: July 27, 2020



### Test Information

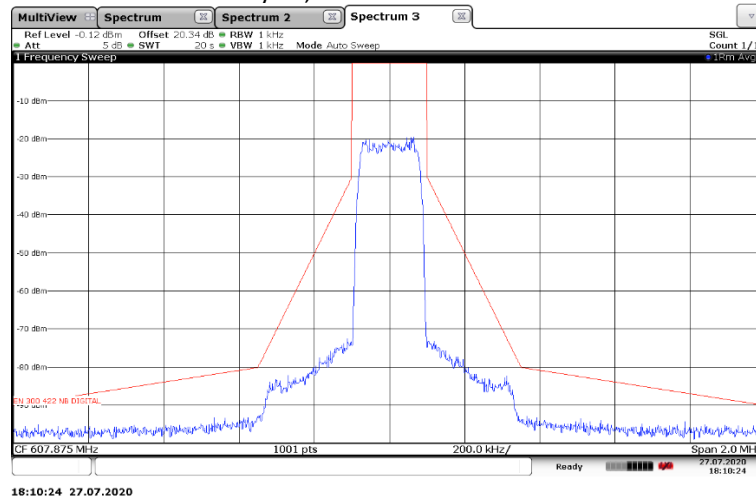
EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: High Frequency, 607.875MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 2; Maximum Relative Level  
 Date Tested: July 27, 2020



## Appendix A

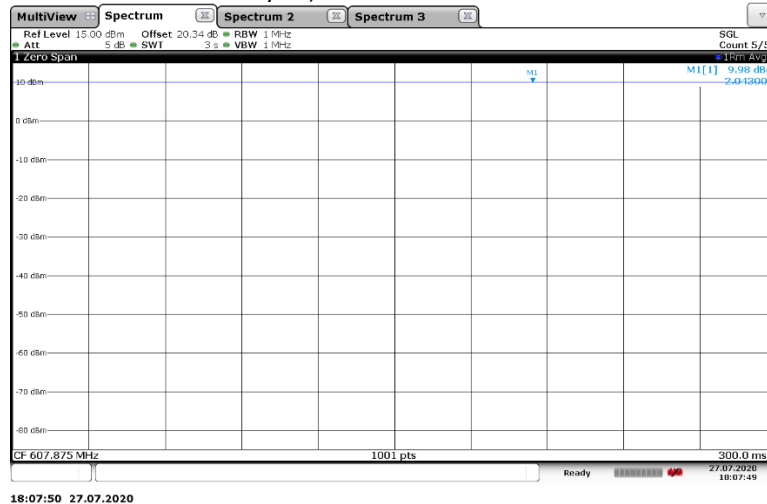
### Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: EN 300 422 Digital Necessary Bandwidth  
 Operating Conditions: High Frequency, 607.875MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 3; Lower and upper frequency transmitter band  
 Wide band noise floor  
 Date Tested: July 27, 2020



### Test Information

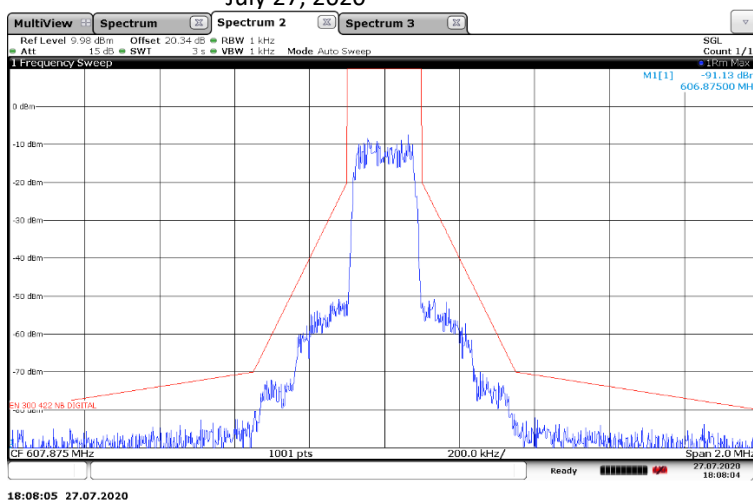
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 Operator Name: Juan Castrejon  
 Comment: 8.3.3.1: Step 1; Carrier Power  
 Date Tested: July 27, 2020





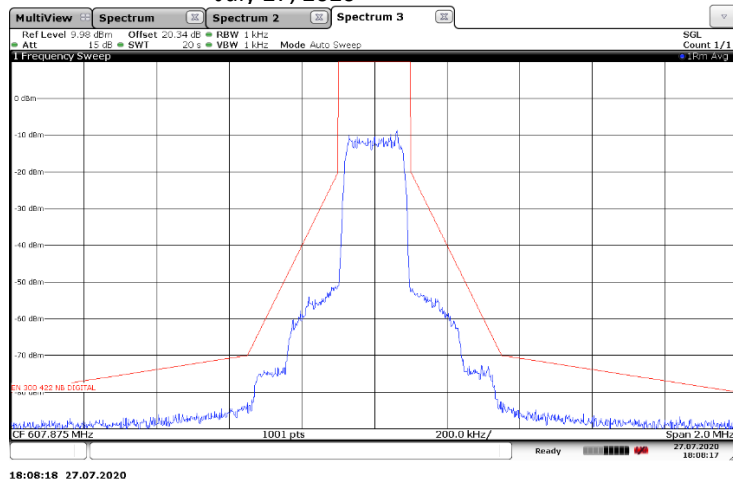
## Test Information

|                       |   |
|-----------------------|---|
| EUT Name:             | QLXD2 J50A                              |
| Serial Number:        | N6                                      |
| Test Description:     | EN 300 422 Digital Necessary Bandwidth  |
| Operating Conditions: | High Frequency, 607.875MHz, 10mW        |
| Operator Name:        | Juan Castrejon                          |
| Comment:              | 8.3.3.1: Step 2; Maximum Relative Level |
| Date Tested:          | July 27, 2020                           |



## Test Information

|                       |  |
|-----------------------|--|
| EUT Name:             | QLXD2 J50A   |
| Serial Number:        | N6   |
| Test Description:     | EN 300 422 Digital Necessary Bandwidth   |
| Operating Conditions: | High Frequency, 607.875MHz, 10mW   |
| Operator Name:        | Juan Castrejon   |
| Comment:              | 8.3.3.1: Step 3; Lower and upper frequency transmitter band<br>Wide band noise floor |
| Date Tested:          | July 27, 2020  |





**Appendix A**

**RSS-210, RSS-Gen 99% Emissions Bandwidth**

| QLXD2 Unit # N6 | Frequency in MHz | Measured 99% BW (kHz) | RSS-210 Limit (kHz) |
|-----------------|------------------|-----------------------|---------------------|
|                 | 572.000          | 162.65                | 200                 |
|                 | 589.925          | 162.44                | 200                 |
|                 | 607.875          | 162.28                | 200                 |

RF Power Output set to 10 mW

Tested by Juan Castrejon, November 9, 2020

## Appendix B

### Spurious Emissions

#### Purpose:

This test performed to determine if the EUT meets the radiated RF emission requirements of the FCC Part 74H Section 74.861(e)(7) and FCC OET Basic Certification Requirements for Wireless Microphones over the frequency range from 30MHz to 6GHz. An Average detector was used for the measurements.

#### Requirements:

As stated in FCC 74H section 74.861(e)(7), the FCC OET Basic Certification Requirements For Wireless Microphones, and RSS-210 Annex G, Compliance for spurious emission requirements shall be demonstrated using the applicable measurement procedures of ETSI EN 300 422-1. Compliance with the emission limits shall be demonstrated using an RMS Average detector. Both the FCC Part 74H and RSS-210 require Emissions shall be investigated up to the 10<sup>th</sup> harmonic of the fundamental.

#### Measurement Uncertainty:

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence)

| Measurement Type  | U <sub>lab</sub> | U <sub>ETSI</sub> |
|---|------------------|-------------------|
| Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz) | 4.24 dB          | 6.00 dB           |
| Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 13 GHz)    | 4.56 dB          | 6.00 dB           |

U<sub>lab</sub> = Determined for Shure EMC Laboratory

U<sub>ETSI</sub> = From ETSI EN 300 422-1 Table 10

Since U<sub>lab</sub> is less than or equal to U<sub>ETSI</sub>:

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;  
Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

#### Test Setup and Instrumentation:

A Shure KSM8 microphone head was used. Photographs of the test setup are shown in Figure B 1 and Figure B 2. The test instrumentation can be determined from Table 10-1.

#### EUT Operation:

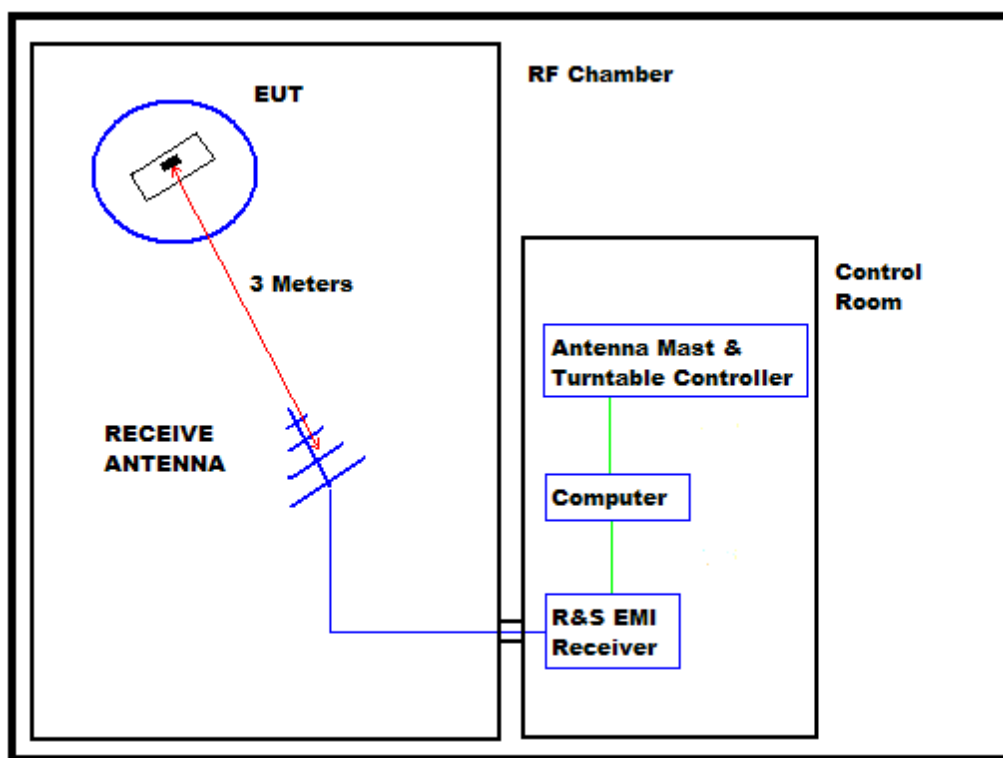
A Shure microphone was plugged into the EUT. The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. The EUT was checked for proper operation after it was setup on the test table. For radiated spurious emissions the testing was performed with the EUT set to the low, middle, and high frequencies with RF power output of 1mW and 10mW.

## Appendix B

### Specific Test Procedures:

All tests were performed in a 28ft. x 20ft. x 18.5ft. 3m semi-anechoic test chamber. The walls and ceiling of the shielded chamber are lined with ferrite tiles. Anechoic absorber material is installed over the ferrite tile. The floor of the chamber is used as the ground plane. The chamber complies with ANSI C63.4a-2017 for site attenuation.

The shielded enclosure prevents emissions from other sources, such as radio and TV stations from interfering with the measurements. All power lines and signal lines entering the enclosure pass through filters on the enclosure wall. The power line filters prevent extraneous signals from entering the enclosure on these leads.



**BLOCK DIAGRAM OF SHIELDED ENCLOSURE**

Preliminary radiated measurements were performed to determine the frequencies where the significant emissions might be found. With the EUT at one set position and the measurement antenna at a set height (i.e. without maximizing), the radiated emissions were measured using a peak detector and automatically plotted. The BiConiLog measuring antenna was positioned at a 3-meter distance from the EUT for below 1GHz testing, and a double ridged waveguide antenna above 1GHz testing.

**Appendix B**

All significant broadband and narrowband signals found in the preliminary sweeps were then measured using a peak detector at a test distance of 3 meters.

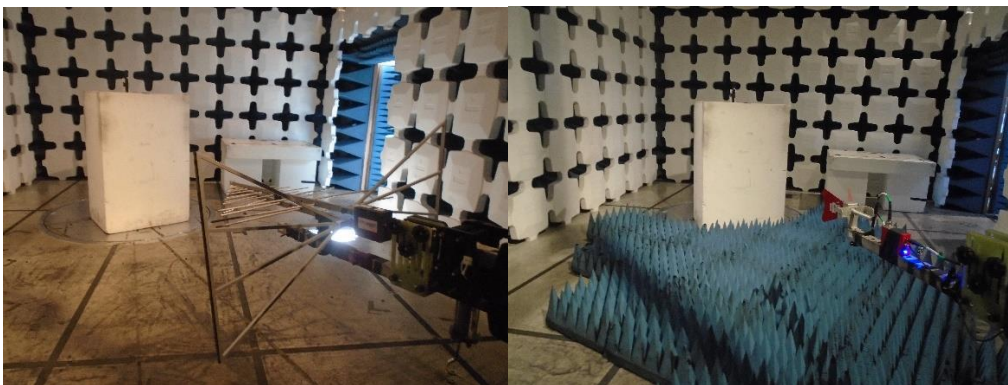
To ensure that maximum emission levels were measured, the following steps were taken:

- i. The EUT was rotated so that all its sides were exposed to the receiving antenna.
- ii. Since the measuring antennas are linearly polarized, both horizontal and vertical field components were measured.
- iii. The measuring antenna was raised and lowered from 1 to 4 meters for each antenna polarization to maximize the readings.

The equivalent power was determined from the field intensity levels measured at 3 meters using the substitution method. To determine the emission power, another antenna was set in place of the EUT and connected to a calibrated signal generator. (A tuned dipole was used for all measurements below 1GHz and a double ridged waveguide antenna was used for all measurements above 1GHz.) The output of the signal generator was adjusted to match the received level at the EMI receiver. The signal level was recorded. The reading was corrected to compensate for cable loss and antenna gain.

**Results:**

The plots of the peak preliminary radiated voltage levels in the graphs on page 24 thru page 29. The ERP measurements are shown on pages 30 thru page 31. All emissions measured from the EUT were within the ETSI EN 300 422-1 specification limits.



**Figure B 1: QLXD2 Transmitter Test Setup**

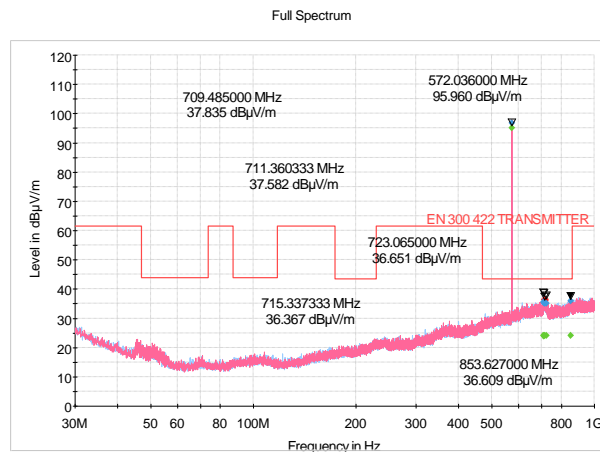
**Figure B 2: QLXD2 Transmitter Test Setup**

## Appendix B

### SHURE Radiated RF Emissions Test Report

#### Common Information

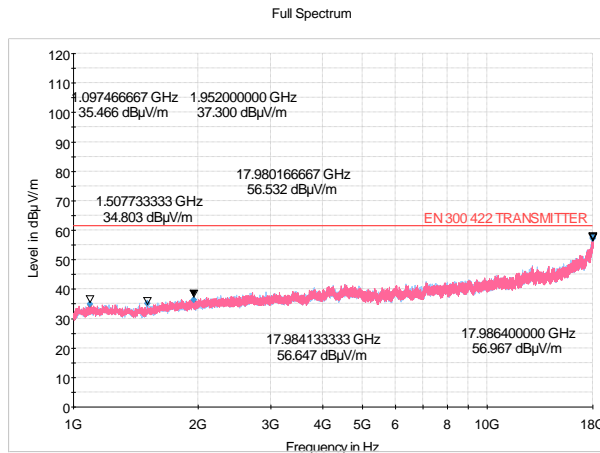
Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz  
 EUT: QLXD2 J50A  
 Serial Number: 1  
 Operating Frequency: Low Frequency 572.000MHz  
 RF Power Level: 1mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 3, 2020, 75F 39% RH



### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 7GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: Low frequency 572.000MHz  
 RF Power Level: 1mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 13, 2020, 75F 42% RH



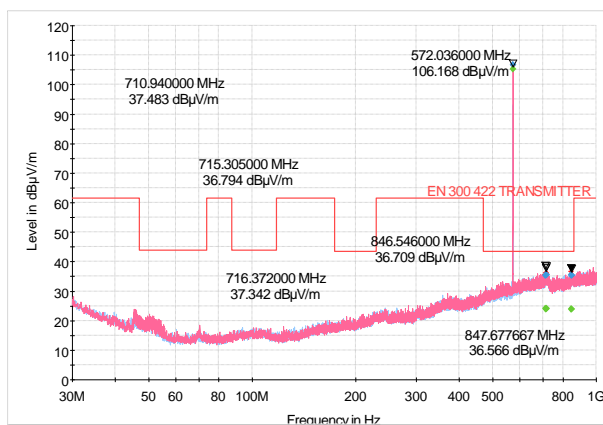
## Appendix B

### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz  
EUT: QLXD2 J50A  
Serial Number: N6  
Operating Frequency: Low Frequency 572.000MHz  
RF Power Level: 10mW  
Tester Name: Sharjeel Sohail  
Date Tested: August 3, 2020, 75F 40% RH

Full Spectrum

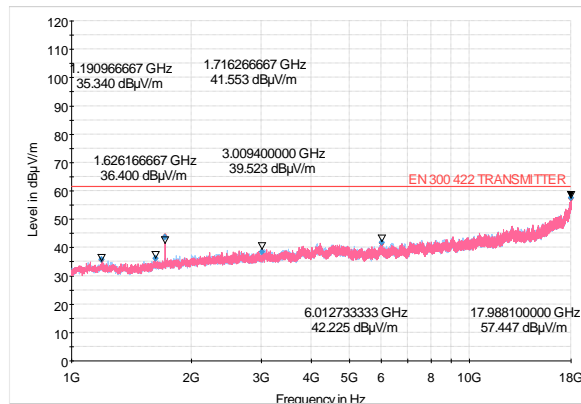


### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 7GHz  
EUT: QLXD2 J50A  
Serial Number: N6  
Operating Frequency: Low Frequency 572.000MHz  
RF Power Level: 10mW  
Tester Name: Sharjeel Sohail  
Date Tested: August 13, 2020, 75F 43% RH

Full Spectrum



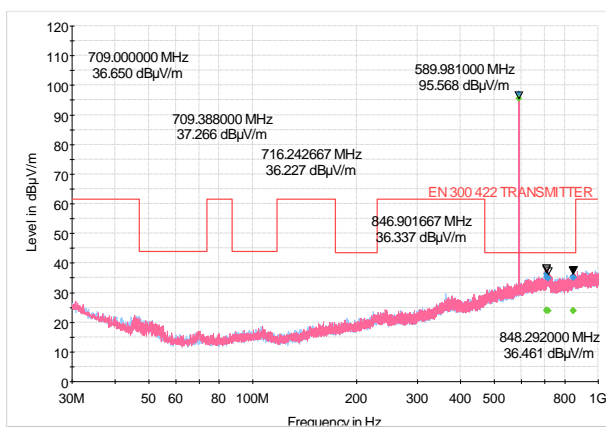
## Appendix B

### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: Middle Frequency 589.925MHz  
 RF Power Level: 1mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 3, 2020, 75F 39% RH

Full Spectrum

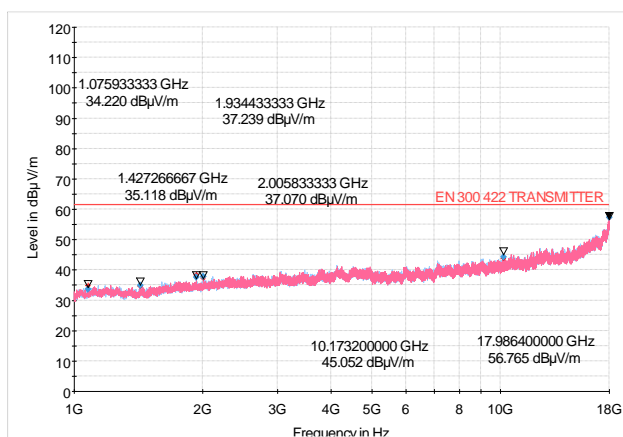


### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 7GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: Middle Frequency 589.925MHz  
 RF Power Level: 1mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 13, 2020, 75F 41% RH

Full Spectrum

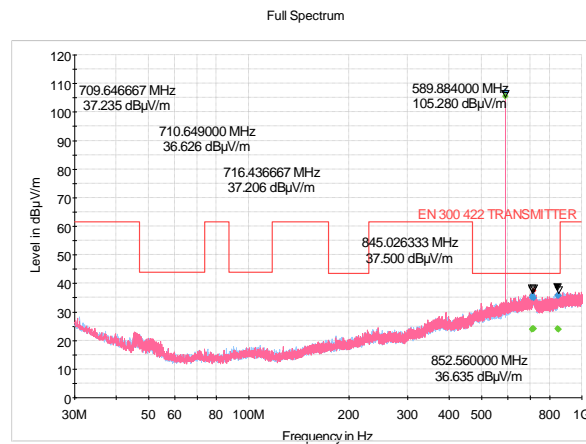


## Appendix B

### SHURE Radiated RF Emissions Test Report

#### Common Information

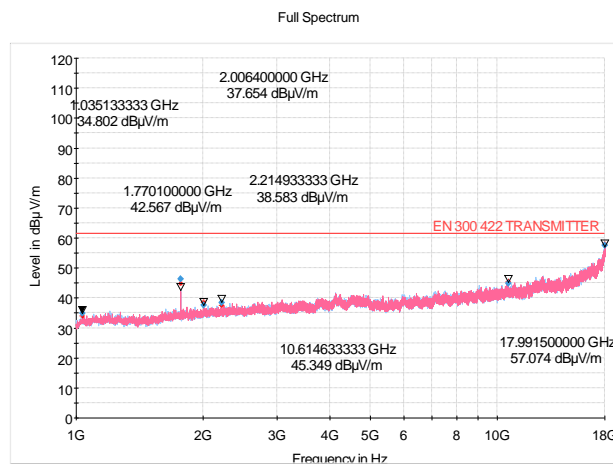
|                      |   |
|----------------------|---|
| Test Description:    | FCC 74H Radiated Emissions 30MHz - 1GHz |
| EUT                  | QLXD2 J50A                              |
| Serial Number        | N6                                      |
| Operating Frequency: | Middle Frequency 589.925MHz             |
| RF Power Level       | 10mW                                    |
| Tester Name          | Sharjeel Sohail                         |
| Date Tested          | August 4, 2020, 74F 36% RH              |



### SHURE Radiated RF Emissions Test Report

#### Common Information

|                      |  |
|----------------------|--|
| Test Description:    | FCC 74H Radiated Emissions 1GHz - 7GHz |
| EUT:                 | QLXD2 J50A                             |
| Serial Number:       | N46                                    |
| Operating Frequency: | Middle Frequency 589.925MHz            |
| RF Power Level       | 10mW                                   |
| Tester Name:         | Sharjeel Sohail                        |
| Date Tested          | August 13, 2020, 75F 40% RH            |



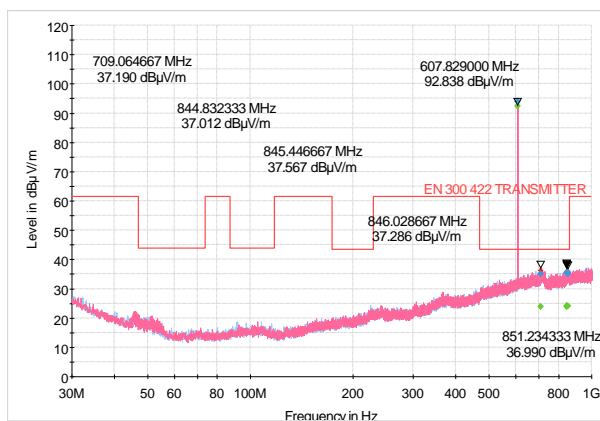
## Appendix B

### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: High Frequency 607.875MHz  
 RF Power Level: 1mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: Aug 4, 2020, 75F 33% RH

Full Spectrum

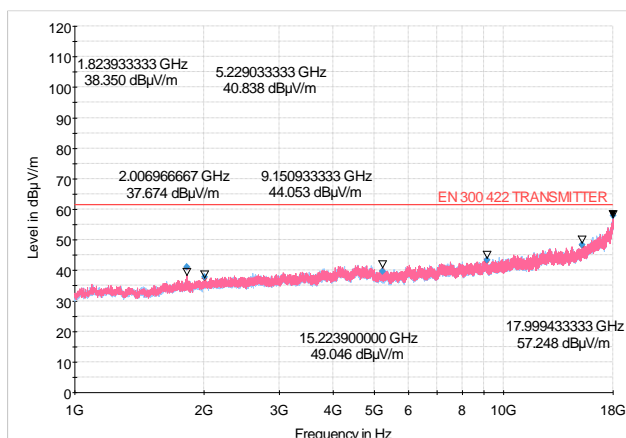


### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 7GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: High Frequency 607.875MHz  
 RF Power Level: 1mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 14, 2020, 73F 44% RH

Full Spectrum



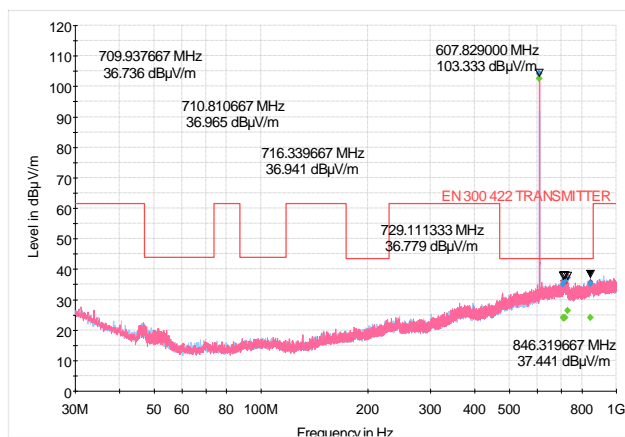
## Appendix B

### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: High Frequency 607.875MHz  
 RF Power Level: 10mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 4, 2020, 75F 35% RH

Full Spectrum

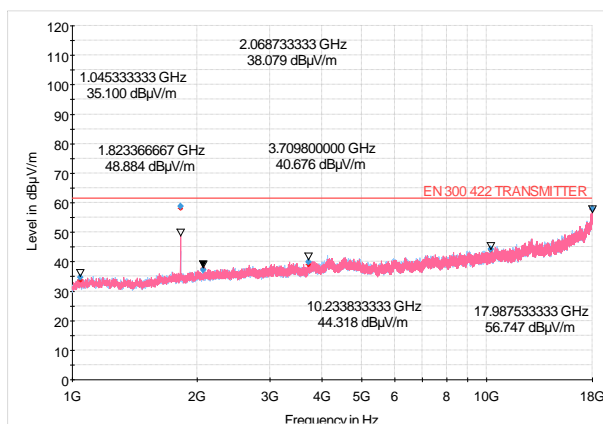


### SHURE Radiated RF Emissions Test Report

#### Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 7GHz  
 EUT: QLXD2 J50A  
 Serial Number: N6  
 Operating Frequency: High Frequency 607.875MHz  
 RF Power Level: 10mW  
 Tester Name: Sharjeel Sohail  
 Date Tested: August 3, 2020, 75F 39% RH

Full Spectrum



## Appendix B

Date: September 9, 2020  
 EUT: QLXD2  
 Band: J50A  
 Serial Number: 1  
 Specification: EN 300 422-1, Spurious Radiated Emissions  
 Comments: Test Distance is 3 meters  
 Mode: EUT set to Low Frequency 572.000MHz at 10mW  
 Tested By: Sharjeel Sohail

| Frequency in MHz | Detector Used | Antenna Polarity | Measured Level in dBuV | Matched Sig. Gen. Reading in dBm | Antenna Gain in dB | Cable Loss in dB | ERP Total in dBm | ETSI Limit in dBm | Margin In dB |
|------------------|---------------|------------------|------------------------|----------------------------------|--------------------|------------------|------------------|-------------------|--------------|
| 1190.967         | Average       | V                | 35.68                  | -63.24                           | 3.65               | 2.81             | -62.40           | -30.00            | 32.40        |
| 1626.167         | Average       | V                | 36.21                  | -75.89                           | 6.10               | 3.33             | -73.13           | -30.00            | 43.13        |
| 1716.267         | Average       | V                | 43.68                  | -63.81                           | 5.57               | 3.48             | -61.72           | -30.00            | 31.72        |
| 3009.400         | Average       | V                | 38.45                  | -64.02                           | 7.10               | 4.53             | -61.45           | -30.00            | 31.45        |

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

Date: September 9, 2020  
 EUT: QLXD2  
 Band: J50A  
 Serial Number: 1  
 Specification: EN 300 422-1, Spurious Radiated Emissions  
 Comments: Test Distance is 3 meters  
 Mode: EUT set to Middle Frequency 589.925MHz at 10mW  
 Tested By: Sharjeel Sohail

| Frequency in MHz | Detector Used | Antenna Polarity | Measured Level in dBuV | Matched Sig. Gen. Reading in dBm | Antenna Gain in dB | Cable Loss in dB | ERP Total in dBm | ETSI Limit in dBm | Margin In dB |
|------------------|---------------|------------------|------------------------|----------------------------------|--------------------|------------------|------------------|-------------------|--------------|
| 1035.133         | Average       | V                | 34.97                  | -71.65                           | 3.09               | 2.62             | -71.18           | -30.00            | 41.18        |
| 1770.100         | Average       | V                | 46.26                  | -49.69                           | 5.26               | 3.44             | -47.87           | -30.00            | 17.87        |
| 2006.400         | Average       | V                | 37.65                  | -68.26                           | 4.95               | 3.70             | -67.01           | -30.00            | 37.01        |
| 2214.933         | Average       | V                | 38.42                  | -76.12                           | 5.49               | 3.91             | -74.54           | -30.00            | 44.54        |

Total (dBm) = Matched Signal. Generator Reading (dBm) + Antenna Gain (dB) – Cable Loss (dB)

## Appendix B

Date: September 9, 2020  
 EUT: QLXD2  
 Band: J50A  
 Serial Number: 1  
 Specification: EN 300 422-1, Spurious Radiated Emissions  
 Comments: Test Distance is 3 meters  
 Mode: EUT set to High Frequency 607.875MHz at 10mW  
 Tested By: Sharjeel Sohail

| Frequency<br>in MHz | Detector<br>Used | Antenna<br>Polarity | Measured<br>Level in<br>dBuV | Matched<br>Sig. Gen.<br>Reading<br>in dBm | Antenna<br>Gain<br>in dB | Cable<br>Loss<br>in dB | ERP<br>Total<br>in dBm | ETSI<br>Limit<br>in dBm | Margin<br>In dB |
|---------------------|------------------|---------------------|------------------------------|---|--------------------------|------------------------|------------------------|-------------------------|-----------------|
| 1045.333            | Average          | V                   | 34.57                        | -70.51                                    | 3.24                     | 2.65                   | -69.93                 | -30.00                  | 39.93           |
| 1823.367            | Average          | V                   | 58.79                        | -36.41                                    | 4.99                     | 3.56                   | -34.98                 | -30.00                  | 4.98            |
| 2068.733            | Average          | V                   | 37.07                        | -73.97                                    | 5.23                     | 3.83                   | -72.58                 | -30.00                  | 42.58           |
| 3709.800            | Average          | V                   | 39.83                        | -68.26                                    | 8.32                     | 5.32                   | -65.26                 | -30.00                  | 35.26           |

## Appendix C

### Maximum Conducted Power

#### Purpose:

This test performed to determine if the EUT meets the Maximum Conducted Power requirements of the FCC Part 74H, Section 74.861(e)(1)(ii), the FCC OET Basic Certification Requirements For Wireless Microphones, and RSS-210.

#### Requirements:

As stated in FCC Part 74H, Section 74.861(e)(1)(ii). In the FCC OET Basic Certification Requirements For Wireless Microphones, it states in Part III(e)(1)(ii) that this measurement is conducted. RSS-210 requirement is for EIRP.

#### Measurement Uncertainty:

All measurements are an estimate of their true value. The measurement uncertainty characterizes, with a specified confidence level, the spread of values which may be possible for a given measurement system.

Values of Expanded Measurement Uncertainty (95% Confidence)

| Measurement Type                           | $U_{lab}$ |
|--|-----------|
| Conducted measurements (30 MHz – 1000 MHz) | 1.24 dB   |

$U_{lab}$  = Determined for Shure EMC Laboratory

Since  $U_{lab}$  is less than or equal to  $U_{ETSI}$ :

- Compliance is deemed to occur if no measured disturbance exceeds the disturbance limit;  
Non-compliance is deemed to occur if any measured disturbance exceeds the disturbance limit.

#### Test Setup and Instrumentation:

Photographs of the test setup are shown in Figure C 1. The test instrumentation can be determined from Table 10-1.

#### EUT Operation:

A Shure KSM8 microphone head was used. The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. For rated output power, the testing was performed with the EUT set to the low, middle, and high frequency within the operating frequency range, and at 1mW and 10mW RF output.

**Appendix C****Specific Test Procedures:**

The output of the EUT was connected to the input of a 20dB attenuator. The output of the attenuator was connected to the input of an ETS-Lindgren EMPower USB RF Power Sensor.

The EMPower software was set to:

Trigger Level = -40dBm

Measure Time = 500mS

Sample Rate (S/s) = 5MS/s

Gap Time = 2.5mS

Threshold Level = -30dBc

Assembly Gain = 0dBi

Beamforming Gain = 0dB

The EUT was set to transmit on the low, middle, and high frequencies, and power levels of 1mW and 10mW.

**Results:**

The conducted RF power output for all frequencies measured meets the FCC 74H Section 74.861(e)(1)(ii) and the FCC OET "Basic Certification Requirements For Wireless Microphones, Part III(e)(1)(ii).

The results are shown on page 34 thru page 39.

The temperature during the test was 75 degrees F, with relative humidity of 18%.



**Figure C 1: Test setup for Maximum Power Output**

## Appendix C

### Test Information

EUT Name: QLXD2 J50A  
Serial Number: N6  
Test Description: Maximum Power Output  
Operating Conditions: Low Frequency, 572.00MHz, 1mW  
Operator Name: Juan Castrejon  
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)  
Date Tested: July 27, 2020

| Power Meter<br>Measurement<br>in dBm | Power Meter<br>Measured<br>in mW | Limit<br>in mW | Margin<br>In mW |
|--------------------------------------|----------------------------------|----------------|-----------------|
| 0.09                                 | 1.02                             | 250.00         | 248.98          |

### Test Information

EUT Name: QLXD2 J50A  
Serial Number: N6  
Test Description: Maximum Rated Output  
Operating Conditions: Low Frequency, 572.000MHz, 10mW  
Operator Name: Juan Castrejon  
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)  
Date Tested: July 27, 2020

| Power Meter<br>Measurement<br>in dBm | Power Meter<br>Measured<br>in mW | Limit<br>in mW | Margin<br>In mW |
|--------------------------------------|----------------------------------|----------------|-----------------|
| +10.23                               | 10.54                            | 250.00         | 239.46          |

## Appendix C

### Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: Maximum Rated Output  
 Operating Conditions: Middle Frequency, 589.925MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: FCC Part 74H, Section 74.861(e)(1)(ii)  
 Date Tested: July 27, 2020

| Power Meter<br>Measurement<br>in dBm | Power Meter<br>Measured<br>in mW | Limit<br>in mW | Margin<br>In mW |
|--------------------------------------|----------------------------------|----------------|-----------------|
| -0.01                                | 1.00                             | 250.00         | 249.00          |

### Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: Maximum Rated Output  
 Operating Conditions: Middle Frequency, 589.925MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: FCC Part 74H, Section 74.861(e)(1)(ii)  
 Date Tested: July 27, 2020

| Power Meter<br>Measurement<br>in dBm | Power Meter<br>Measured<br>in mW | Limit<br>in mW | Margin<br>In mW |
|--------------------------------------|----------------------------------|----------------|-----------------|
| +10.16                               | 10.38                            | 250.00         | 239.70          |

## Appendix C

### Test Information

EUT Name: QLXD1 J50A  
Serial Number: N6  
Test Description: Maximum Rated Output  
Operating Conditions: High Frequency, 607.875MHz, 1mW  
Operator Name: Juan Castrejon  
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)  
Date Tested: July 27, 2020

| Power Meter<br>Measurement<br>in dBm | Power Meter<br>Measurement<br>in mW | Limit<br>in mW | Margin<br>In mW |
|--------------------------------------|-------------------------------------|----------------|-----------------|
| -0.12                                | 0.97                                | 250.00         | 249.03          |

### Test Information

EUT Name: QLXD2 J50A  
Serial Number: N6  
Test Description: Maximum Rated Output  
Operating Conditions: High Frequency, 607.875MHz, 10mW  
Operator Name: Juan Castrejon  
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)  
Date Tested: July 27, 2020

| Power Meter<br>Measurement<br>in dBm | Power Meter<br>Measurement<br>in mW | Limit<br>in mW | Margin<br>In mW |
|--------------------------------------|-------------------------------------|----------------|-----------------|
| +9.96                                | 9.91                                | 250.00         | 240.09          |

Appendix C

Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: Maximum Power Output  
 Operating Conditions: Low Frequency, 572.000MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: RSS-210  
 Date Tested: July 27, 2020

| Power Meter Measurement in dBm | Power Meter Measured in mW | RSS-210: Measured Antenna Gain in dBi | RSS-210: EIRP in dBm | RSS-210: EIRP in mW | RSS-210: EIRP LIMIT in mW |
|--------------------------------|----------------------------|---------------------------------------|----------------------|---------------------|---------------------------|
| 0.09                           | 1.02                       | -1.3                                  | -1.21                | 0.76                | 250                       |

EIRP (dBm) = Measurement (dBm) + Antenna Gain (dBi)

G50 Measured antenna gain = -1.3dBi

Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: Maximum Rated Output  
 Operating Conditions: Low Frequency, 572.000MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: RSS-210  
 Date Tested: July 27, 2020

| Power Meter Measurement in dBm | Power Meter Measured in mW | RSS-210: Measured Antenna Gain in dBi | RSS-210: EIRP in dBm | RSS-210: EIRP in mW | RSS-210: EIRP LIMIT in mW |
|--------------------------------|----------------------------|---------------------------------------|----------------------|---------------------|---------------------------|
| +10.23                         | 10.54                      | -1.3                                  | 8.93                 | 7.82                | 250                       |

EIRP (dBm) = Measurement (dBm) + Antenna Gain (dBi)

G50 Measured antenna gain = -1.3dB

## Appendix C

### Test Information

EUT Name: QLXD2 J50A  
Serial Number: N6  
Test Description: Maximum Rated Output  
Operating Conditions: Middle Frequency, 589.925MHz, 1mW  
Operator Name: Juan Castrejon  
Comment: RSS-210  
Date Tested: July 27, 2020

| Power Meter Measurement in dBm | Power Meter Measured in mW | RSS-210: Measured Antenna Gain in dBi | RSS-210: EIRP in dBm | RSS-210: EIRP in mW | RSS-210: EIRP LIMIT in mW |
|--------------------------------|----------------------------|---------------------------------------|----------------------|---------------------|---------------------------|
| -0.01                          | 1.02                       | -1.3                                  | -1.31                | 0.74                | 250                       |

$EIRP = (dBm) = \text{Measurement (dBm)} + \text{Antenna Gain (dBi)}$

G50 Measured antenna gain = -1.3dBi

### Test Information

EUT Name: QLXD2 J50A  
Serial Number: N6  
Test Description: Maximum Rated Output  
Operating Conditions: Middle Frequency, 589.925MHz, 10mW  
Operator Name: Juan Castrejon  
Comment: RSS-210  
Date Tested: July 27, 2020

| Power Meter Measurement in dBm | Power Meter Measured in mW | RSS-210: Measured Antenna Gain in dBi | RSS-210: EIRP in dBm | RSS-210: EIRP in mW | RSS-210: EIRP LIMIT in mW |
|--------------------------------|----------------------------|---------------------------------------|----------------------|---------------------|---------------------------|
| +10.16                         | 10.38                      | -1.3                                  | 8.86                 | 7.69                | 250                       |

$EIRP = (dBm) = \text{Measurement (dBm)} + \text{Antenna Gain (dBi)}$

G50 Measured antenna gain = -1.3dBi

## Appendix C

### Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: Maximum Rated Output  
 Operating Conditions: High Frequency, 607.875MHz, 1mW  
 Operator Name: Juan Castrejon  
 Comment: RSS-210  
 Date Tested: July 27, 2020

| Power Meter Measurement in dBm | Power Meter Measurement in mW | RSS-210: Measured Antenna Gain in dBi | RSS-210: EIRP in dBm | RSS-210: EIRP in mW | RSS-210: EIRP LIMIT in mW |
|--------------------------------|-------------------------------|---------------------------------------|----------------------|---------------------|---------------------------|
| -0.12                          | 0.97                          | -1.3                                  | -1.42                | 0.72                | 250                       |

$EIRP = (dBm) = \text{Measurement (dBm)} + \text{Antenna Gain (dBi)}$

G50 Measured antenna gain = -1.3dBi

### Test Information

EUT Name: QLXD2 J50A  
 Serial Number: N6  
 Test Description: Maximum Rated Output  
 Operating Conditions: High Frequency, 607.875MHz, 10mW  
 Operator Name: Juan Castrejon  
 Comment: RSS-210  
 Date Tested: July 27, 2020

| Power Meter Measurement in dBm | Power Meter Measurement in mW | RSS-210: Measured Antenna Gain in dBi | RSS-210: EIRP in dBm | RSS-210: EIRP in mW | RSS-210: EIRP LIMIT in mW |
|--------------------------------|-------------------------------|---------------------------------------|----------------------|---------------------|---------------------------|
| +9.96                          | 9.91                          | -1.3                                  | 8.66                 | 7.35                | 250                       |

$EIRP = (dBm) = \text{Measurement (dBm)} + \text{Antenna Gain (dBi)}$

G50 Measured antenna gain = -1.3dBi