



SHURE

ELECTROMAGNETIC COMPATIBILITY LABORATORY

TEST REPORT

TEST REPORT TITLE: Electromagnetic Compatibility Tests of the Shure QLXD1 Digital Wireless Microphone Transmitter in the G50 Band (470MHz to 534MHz)

TEST ITEM DESCRIPTION:

The Shure QLXD1 is a digital wireless microphone transmitter.

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

Project ID Number: SEL-041/QLXD1 G50 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><i>Craig Kessler</i></u>	<u>Global Compliance Engineer</u>	<u>November 10, 2020</u>
APPROVED BY:	<u><i>Michael Pardy</i></u>	<u>Manager, Quality Labs</u>	<u>November 10, 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. Corrected EIRP calculations



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)
QLXD1	G50	470 to 534	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	470.125, 502.050, 534.000	A	Pass
RSS-210, RSS-Gen	99% Emission Bandwidth	2.3.22	470.125, 502.050, 534.000	A	Pass
74.861(e)(7)	Spurious Emissions	2.3.22	470.125, 502.050, 534.000	B	Pass
74.861(e)(1)(ii)	Maximum Rated Power	2.3.22	470.125, 502.050, 534.000	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 QLXD1 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 QLXD1 Digital Wireless Transmitter Sample

Band	Serial Numbers
G50	1 and N2

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 QLXD1 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

Table 10-1 Test Equipment

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



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 470.125MHz, 502.050MHz, and 534.000MHz.

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 microphone was plugged into the EUT. 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 470.125MHz, 502.050MHz, and 534.000MHz, 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%.

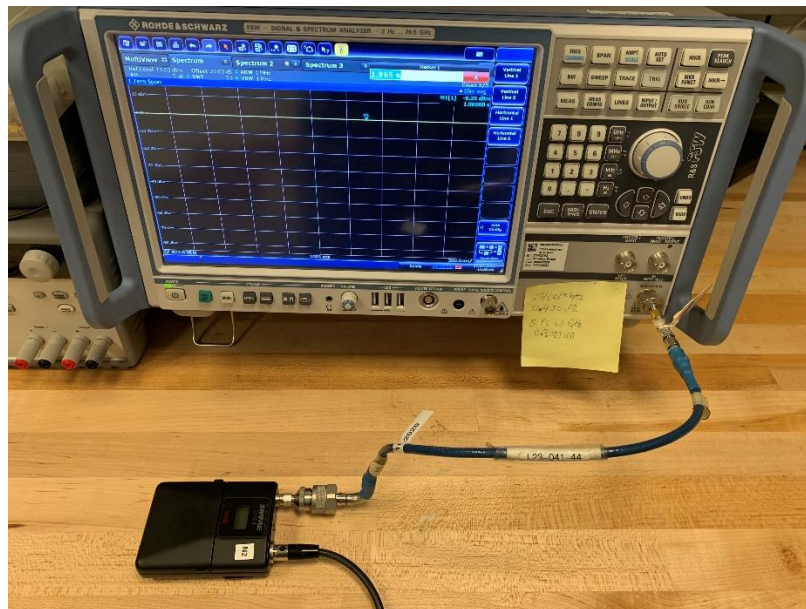


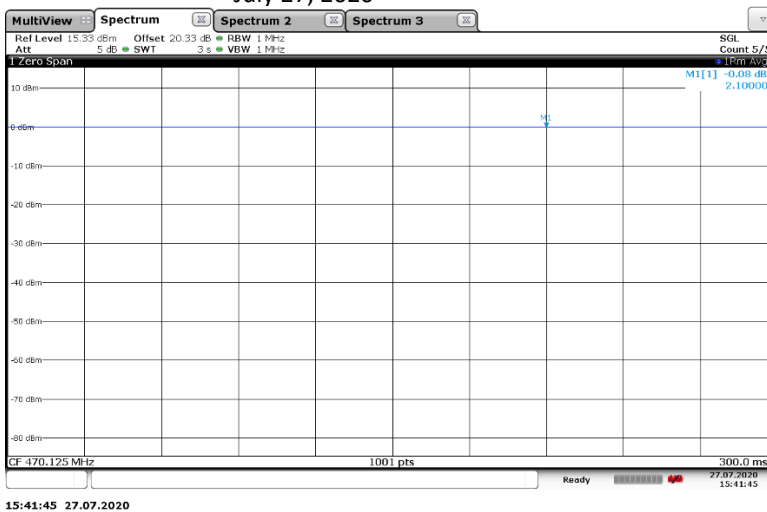
Figure A-1 - Test Setup for Necessary Bandwidth



Appendix A

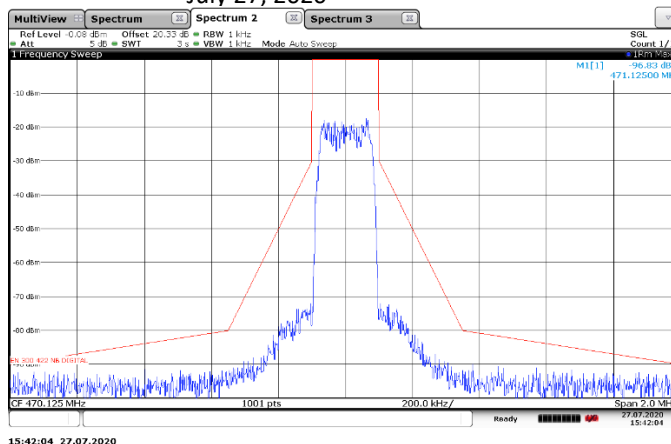
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 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Low Frequency, 470.125MHz, 1mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 1; Carrier Power
 Date Tested: July 27, 2020



Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Low Frequency, 470.125MHz, 1mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 2; Maximum Relative Level
 Date Tested: July 27, 2020

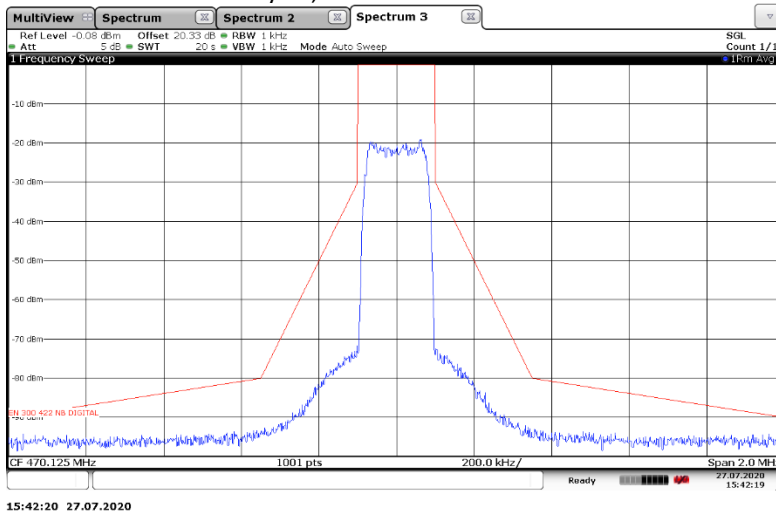




Appendix A

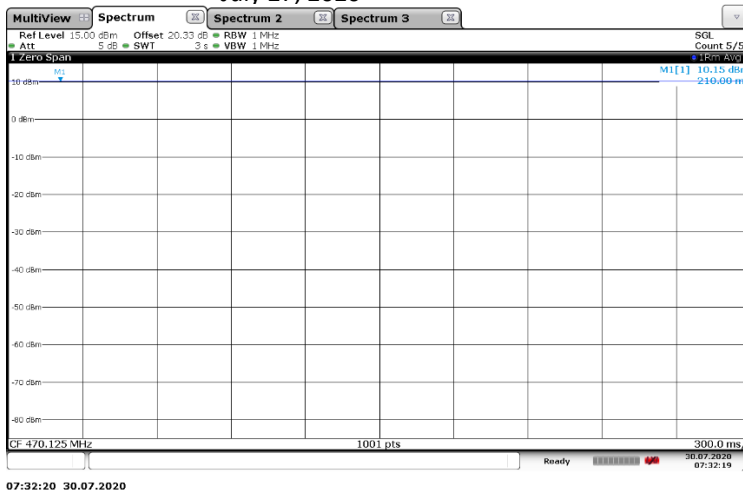
Test Information

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 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Low Frequency, 470.125MHz, 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



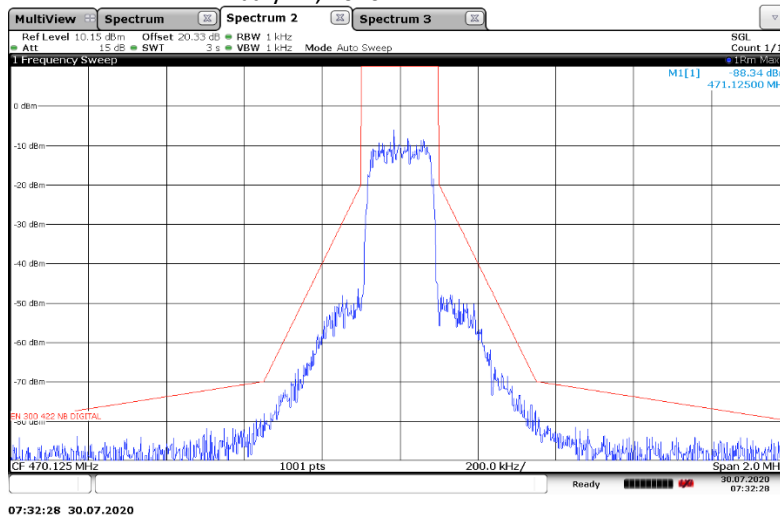
Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Low Frequency, 470.125MHz, 10mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 1; Carrier Power
 Date Tested: July 27, 2020



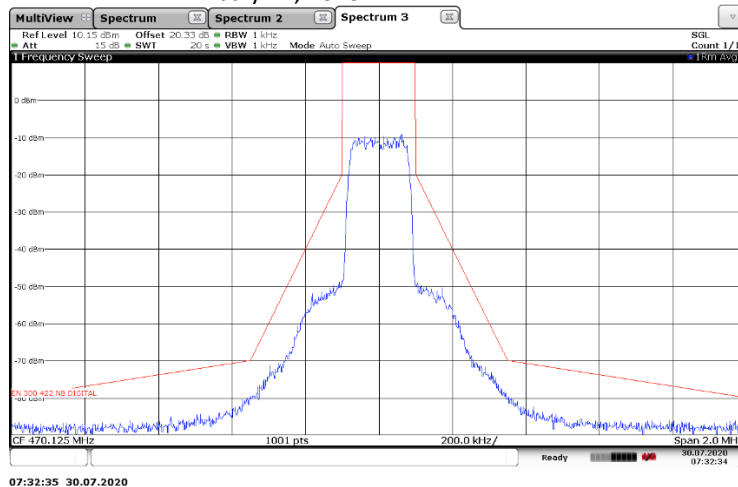
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 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Low Frequency, 470.125MHz, 10mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 2; Maximum Relative Level
 Date Tested: July 27, 2020



Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Low Frequency, 470.125MHz, 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

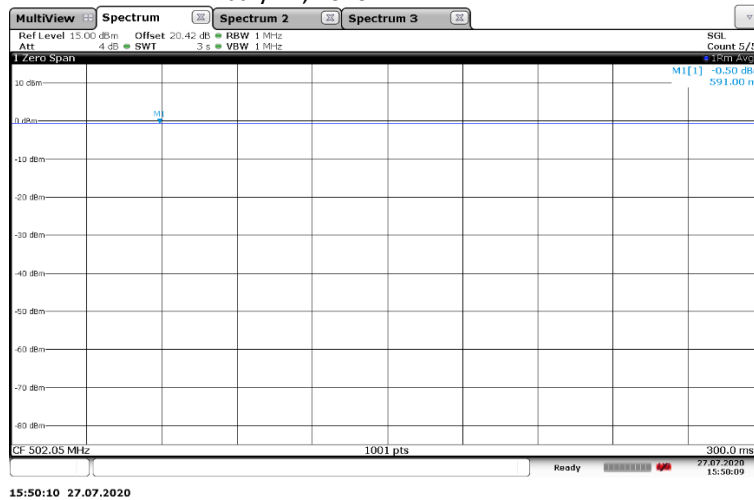




Appendix A

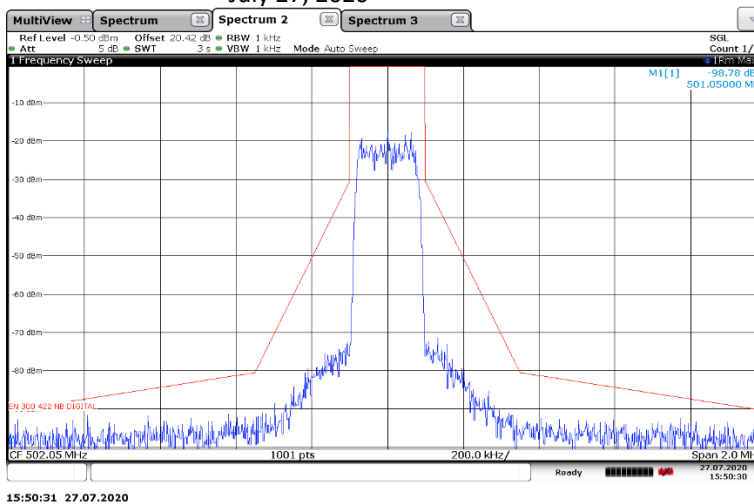
Test Information

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Serial Number: N2
Test Description: EN 300 422 Digital Necessary Bandwidth
Operating Conditions: Middle Frequency, 502.050MHz, 1mW
Operator Name: Juan Castrejon
Comment: 8.3.3.1: Step 1; Carrier Power
Date Tested: July 27, 2020



Test Information

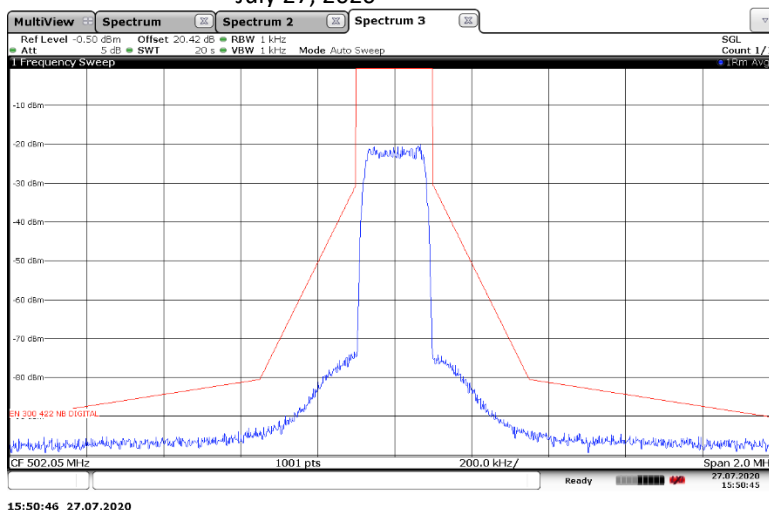
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Serial Number: N2
Test Description: EN 300 422 Digital Necessary Bandwidth
Operating Conditions: Middle Frequency, 502.050MHz, 1mW
Operator Name: Juan Castrejon
Comment: 8.3.3.1: Step 2; Maximum Relative Level
Date Tested: July 27, 2020



Appendix A

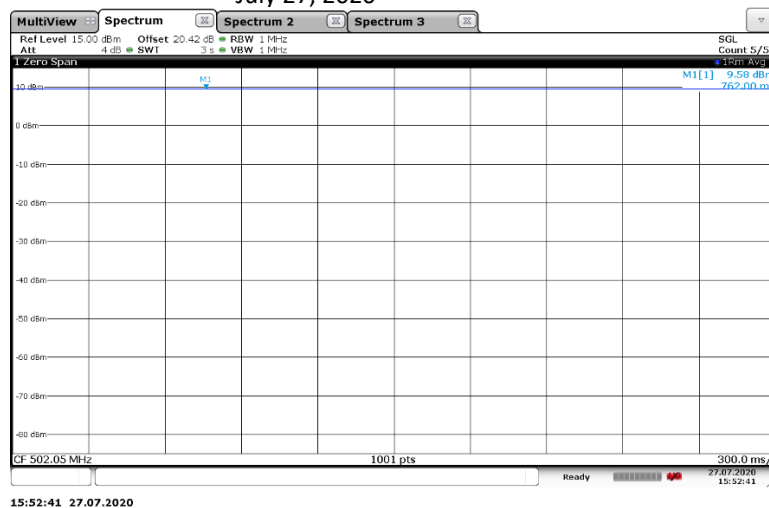
Test Information

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 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Middle Frequency, 502.050MHz, 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



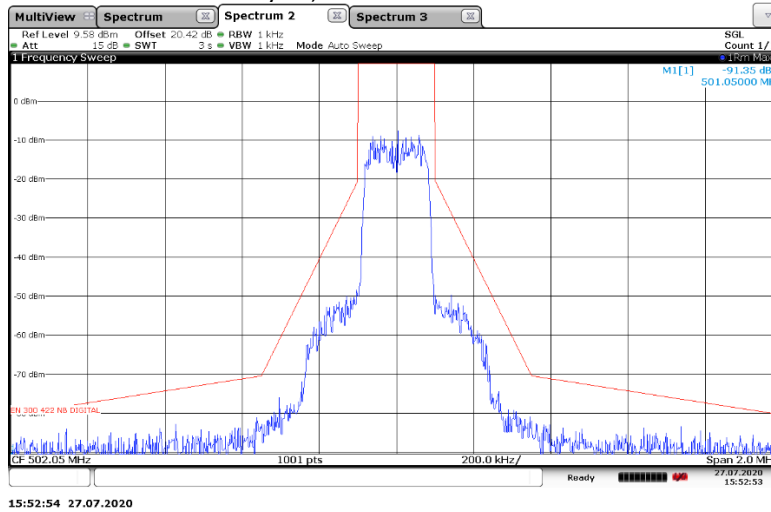
Test Information

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 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Middle Frequency, 502.050MHz, 10mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 1; Carrier Power
 Date Tested: July 27, 2020



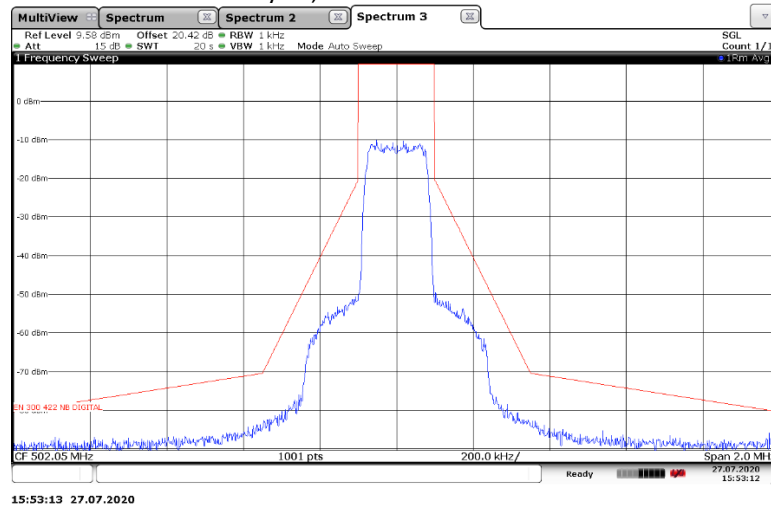
Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: Middle Frequency, 502.050MHz, 10mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 2; Maximum Relative Level
 Date Tested: July 27, 2020



Test Information

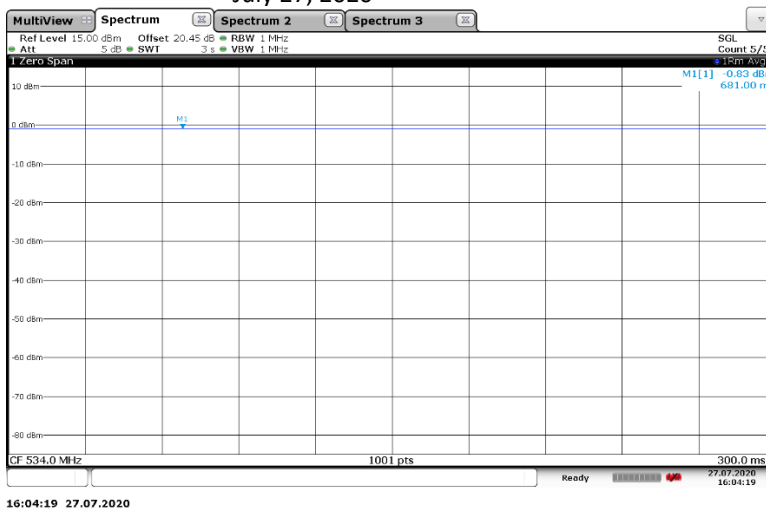
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 Operating Conditions: Middle Frequency, 502.050MHz, 10mW
 Operator Name: Juan Castrejon
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 Wide band noise floor
 Date Tested: July 27, 2020



Appendix A

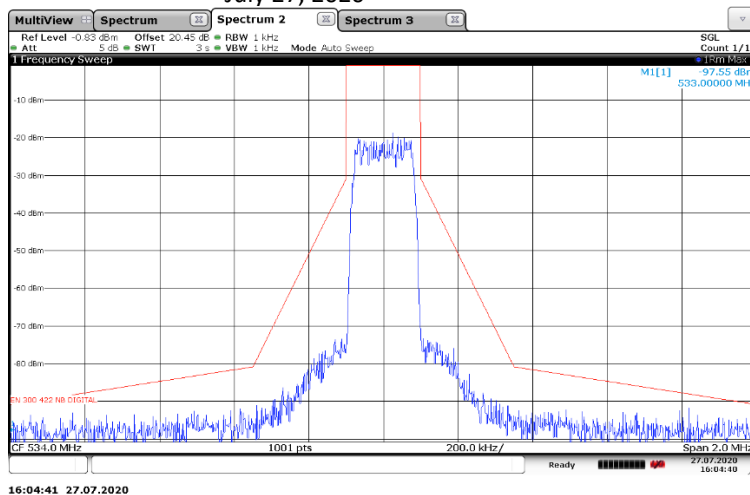
Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: High Frequency, 534.000MHz, 1mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 1; Carrier Power
 Date Tested: July 27, 2020



Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: High Frequency, 534.000MHz, 1mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 2; Maximum Relative Level
 Date Tested: July 27, 2020

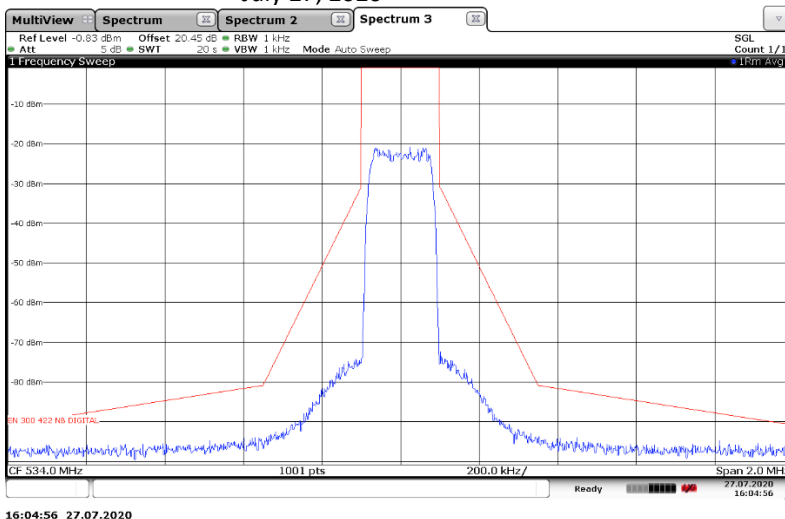




Appendix A

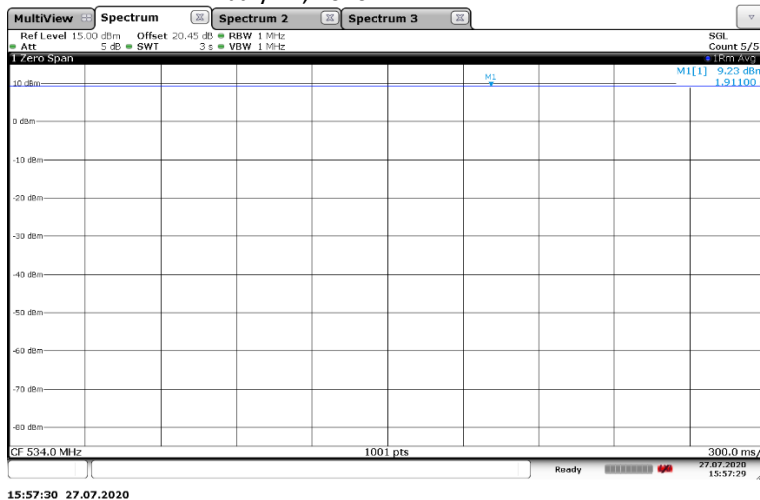
Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: High Frequency, 534.000MHz, 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



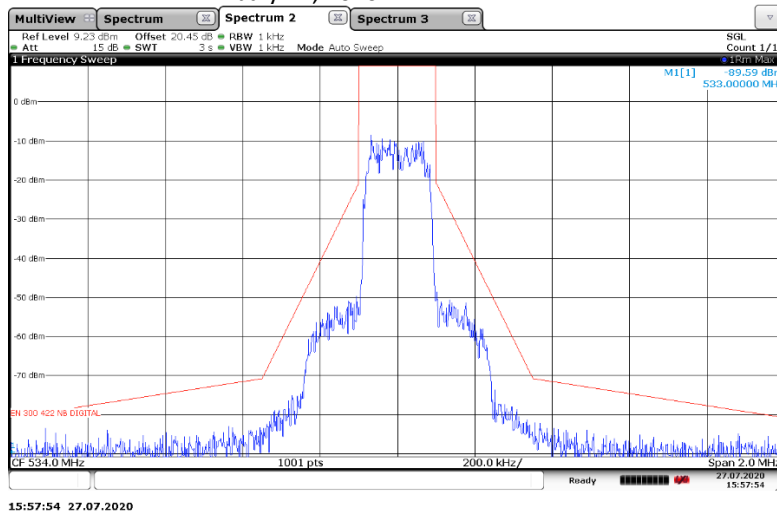
Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: High Frequency, 534.000MHz, 10mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 1; Carrier Power
 Date Tested: July 27, 2020



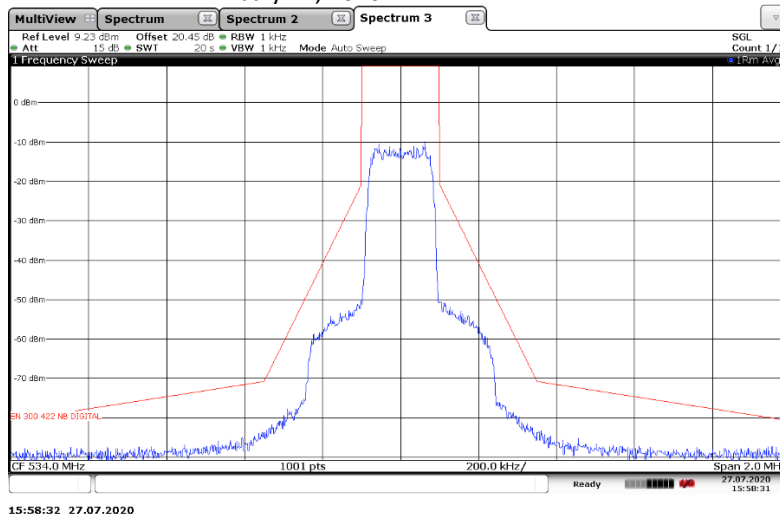
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EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: High Frequency, 534.000MHz, 10mW
 Operator Name: Juan Castrejon
 Comment: 8.3.3.1: Step 2; Maximum Relative Level
 Date Tested: July 27, 2020



Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: EN 300 422 Digital Necessary Bandwidth
 Operating Conditions: High Frequency, 534.000MHz, 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

RSS-210, RSS-Gen 99% Emissions Bandwidth

QLXD1 Unit # N2	Frequency in MHz	Measured 99% BW (kHz)	RSS-210 Limit (kHz)
	470.125	162.38	200
	502.050	162.50	200
	534.000	162.56	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 10th 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_{lab}	U_{ETSI}
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_{lab} = Determined for Shure EMC Laboratory

U_{ETSI} = From ETSI EN 300 422-1 Table 10

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:

A Shure was plugged into the EUT microphone socket. 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:

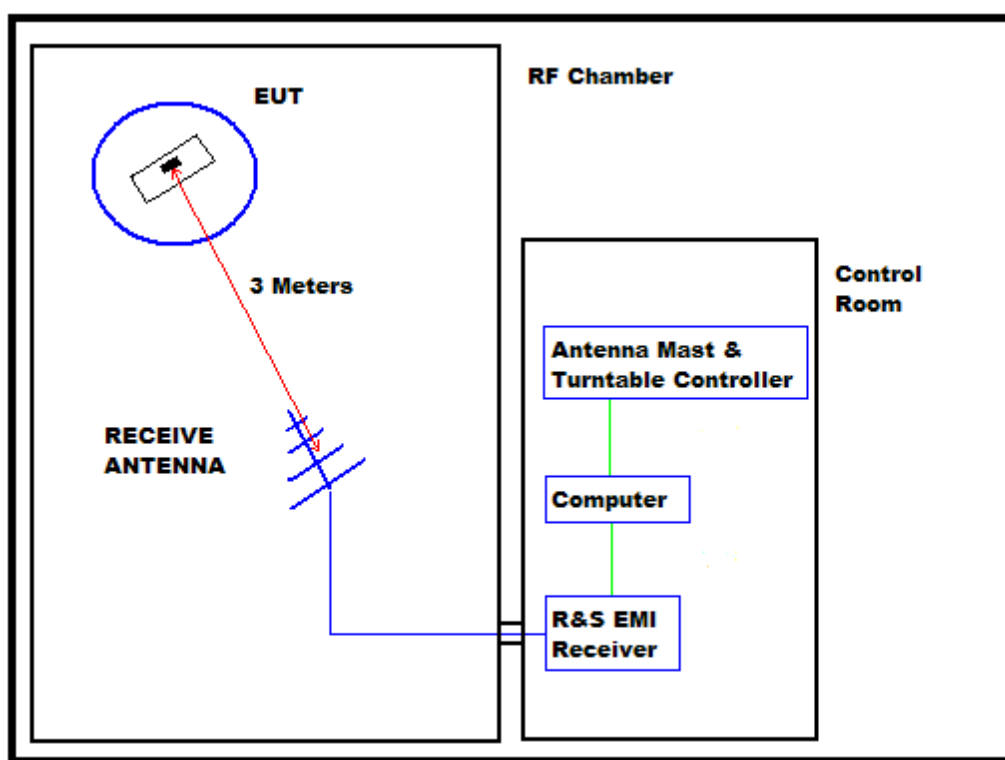
A Shure microphone was plugged into the EUT. The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. The EUT was checked for proper operation after it was setup on the test table. For radiated spurious emissions the testing was performed with the EUT set 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 32. All emissions measured from the EUT were within the ETSI EN 300 422-1 specification limits.



Figure B 1: QLXD1 Transmitter Test Setup

Figure B 2: QLXD1 Transmitter Test Setup

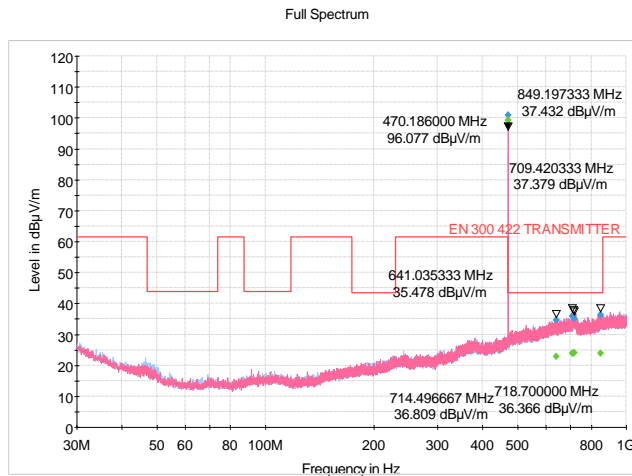


Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

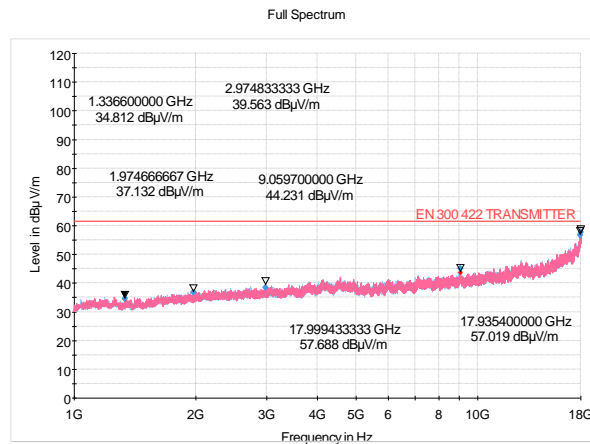
Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz
EUT: QLXD1 G50
Serial Number: 1
Operating Frequency: Low Frequency 470.125MHz
RF Power Level: 1mW
Tester Name: Sharjeel Sohail
Date Tested: July 27, 2020, 75F 46% RH



SHURE Radiated RF Emissions Test Report

Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 6GHz
EUT: QLXD1 G50
Serial Number: 1
Operating Frequency: Low frequency 470.125MHz
RF Power Level: 1mW
Tester Name: Sharjeel Sohail
Date Tested: August 14, 2020, 75F 40% RH



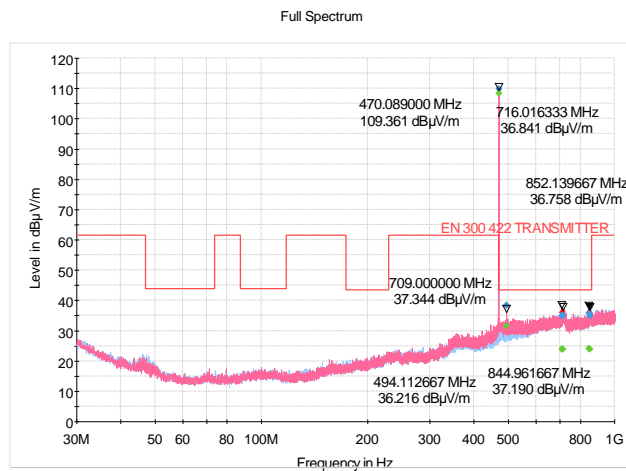


Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

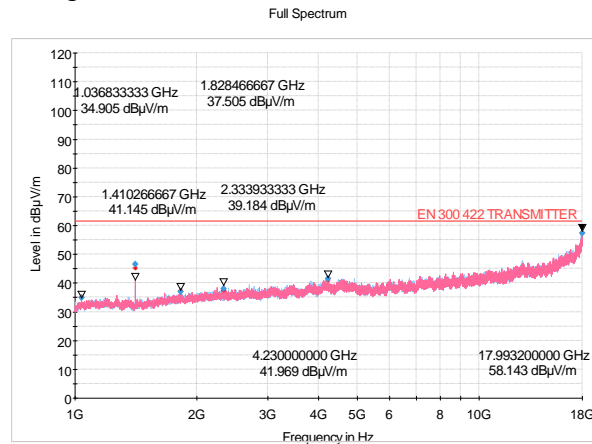
Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz
EUT: QLXD1 G50
Serial Number: 1
Operating Frequency: Low Frequency 470.125MHz
RF Power Level: 10mW
Tester Name: Sharjeel Sohail
Date Tested: July 27, 2020, 75F 47% RH



SHURE Radiated RF Emissions Test Report

Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 6GHz
EUT: QLXD1 G50
Serial Number: 1
Operating Frequency: Low Frequency 470.125MHz
RF Power Level: 10mW
Tester Name: Sharjeel Sohail
Date Tested: August 14, 2020, 75F 40% RH



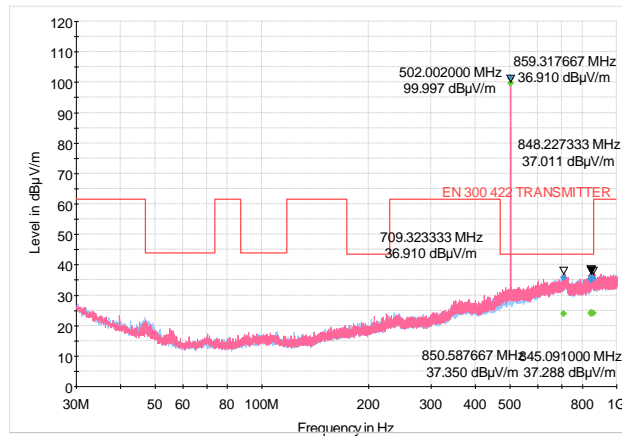
Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description: FCC 74H Radiated Emissions 30MHz - 1GHz
 EUT: QLXD1 G50
 Serial Number: 1
 Operating Frequency: Middle Frequency 502.050MHz
 RF Power Level: 1mW
 Tester Name: Sharjeel Sohail
 Date Tested: July 28, 2020, 73F 43% RH

Full Spectrum

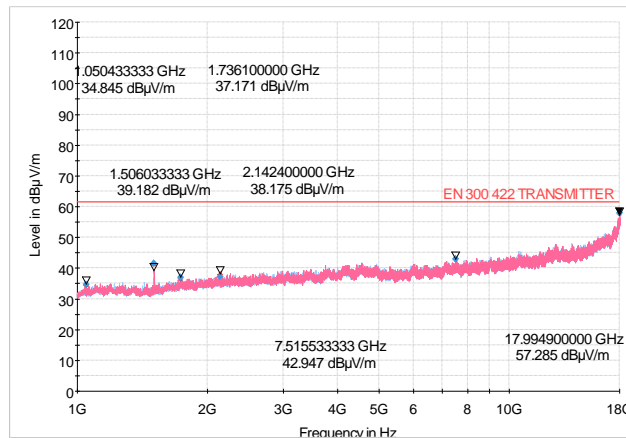


SHURE Radiated RF Emissions Test Report

Common Information

Test Description: FCC 74H Radiated Emissions 1GHz - 6GHz
 EUT: QLXD1 G50
 Serial Number: 1
 Operating Frequency: Middle Frequency 502.050MHz
 RF Power Level: 1mW
 Tester Name: Sharjeel Sohail
 Date Tested: August 14, 2020, 75F 40% RH

Full Spectrum



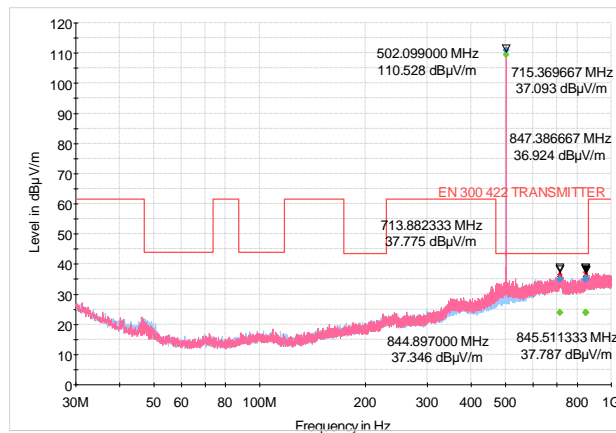
Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 30MHz - 1GHz
EUT	QLXD1 G50
Serial Number	1
Operating Frequency:	Middle Frequency 502.050MHz
RF Power Level	10mW
Tester Name	Sharjeel Sohail
Date Tested	July 28, 2020, 73F 43% RH

Full Spectrum

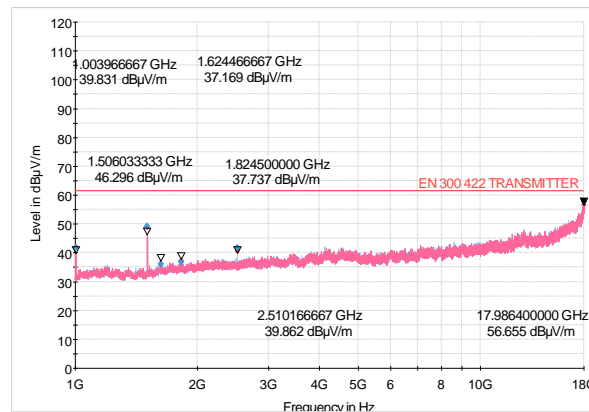


SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 1GHz - 6GHz
EUT:	QLXD1 G50
Serial Number:	1
Operating Frequency:	Middle Frequency 502.050MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	August 14, 2020, 75F 40% RH

Full Spectrum





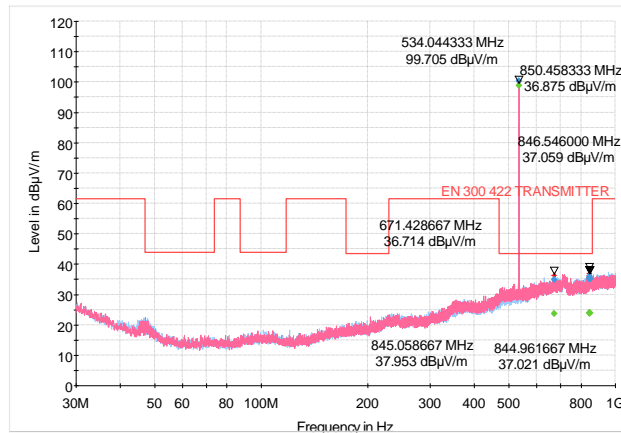
Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 30MHz - 1GHz
EUT	QLXD1 G50
Serial Number	1
Operating Frequency:	High Frequency 534.000MHz
RF Power Level	1mW
Tester Name	Sharjeel Sohail
Date Tested	July 28, 2020, 74F 42% RH

Full Spectrum

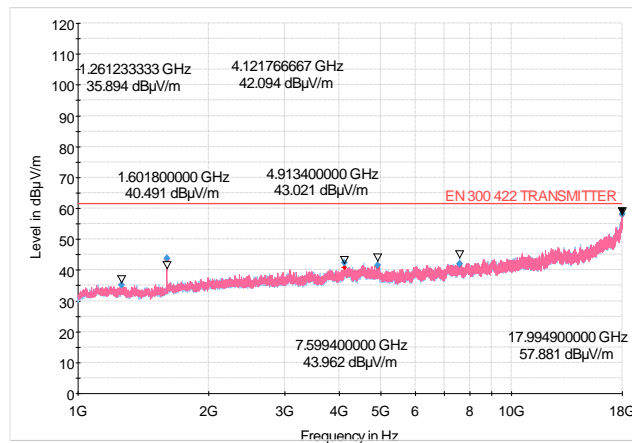


SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 1GHz - 6GHz
EUT:	QLXD1 G50
Serial Number:	1
Operating Frequency:	High Frequency 534.000MHz
RF Power Level	1mW
Tester Name:	Sharjeel Sohail
Date Tested	August 17, 2020, 73F 40% RH

Full Spectrum



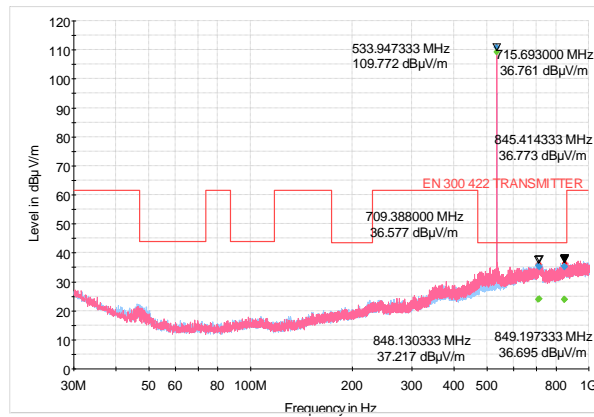
Appendix B

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 30MHz - 1GHz
EUT	QLXD1 G50
Serial Number	1
Operating Frequency:	High Frequency 534.000MHz
RF Power Level	10mW
Tester Name	Sharjeel Sohail
Date Tested	July 28, 2020, 73F 42% RH

Full Spectrum

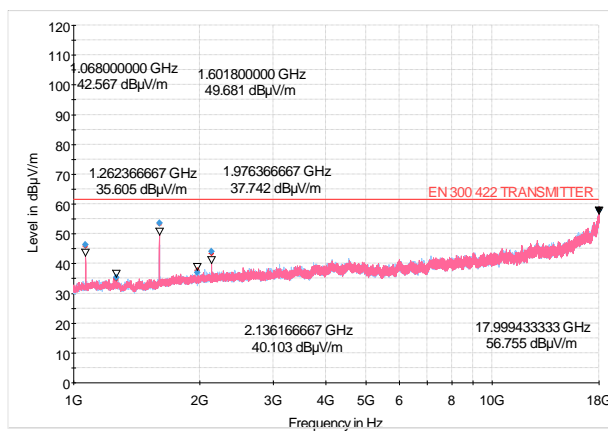


SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 1GHz - 6GHz
EUT:	QLXD1 G50
Serial Number:	1
Operating Frequency:	High Frequency 534.000MHz
RF Power Level	10mW
Tester Name:	Sharjeel Sohail
Date Tested	August 17, 2020, 74F 39% RH

Full Spectrum





Appendix B

Date: September 9, 2020
 EUT: QLXD1
 Band: G50
 Serial Number: 1
 Specification: EN 300 422-1, Spurious Radiated Emissions
 Comments: Test Distance is 3 meters
 Mode: EUT set to Low Frequency 470.125MHz 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
1036.833	Average	V	34.80	-62.07	3.12	2.60	-61.55	-30.00	31.55
1410.267	Average	V	46.44	-49.36	5.26	3.92	-48.02	-30.00	18.02
1828.467	Average	V	36.96	-74.07	5.01	3.49	-72.55	-30.00	42.55
2333.933	Average	V	37.90	-75.93	5.67	3.94	-74.20	-30.00	44.20
4230.000	Average	V	41.46	-69.93	9.40	5.79	-66.32	-30.00	36.32

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

Date: September 9, 2020
 EUT: QLXD1
 Band: G50
 Serial Number: 1
 Specification: EN 300 422-1, Spurious Radiated Emissions
 Comments: Test Distance is 3 meters
 Mode: EUT set to Middle Frequency 502.050MHz 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
1003.967	Average	V	42.83	-48.57	2.66	2.55	-48.46	-30.00	18.46
1506.033	Average	V	49.17	-48.75	6.11	4.08	-46.72	-30.00	16.72
1624.467	Average	V	36.21	-80.37	6.10	3.32	-77.59	-30.00	47.59
1824.500	Average	V	36.84	-74.01	5.00	3.51	-72.52	-30.00	42.52
2510.167	Average	V	41.63	-61.65	6.10	4.14	-59.69	-30.00	29.69

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



Appendix B

Date: September 9, 2020
EUT: QLXD1
Band: G50
Serial Number: 1
Specification: EN 300 422-1, Spurious Radiated Emissions
Comments: Test Distance is 3 meters
Mode: EUT set to High Frequency 534.000MHz 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
1068.000	Average	V	46.36	-44.25	3.37	3.65	-44.53	-30.00	14.53
1262.367	Average	V	35.23	-72.22	3.65	3.00	-71.57	-30.00	41.57
1601.800	Average	V	53.49	-41.77	6.19	4.26	-39.84	-30.00	9.84
1976.367	Average	V	36.90	-75.00	5.00	3.65	-73.66	-30.00	43.66
2136.167	Average	V	43.95	-55.25	5.39	3.85	-53.71	-30.00	23.71

**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 Sure microphone was plugged into the EUT. 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: QLXD1 G50
Serial Number: N2
Test Description: Maximum Power Output
Operating Conditions: Low Frequency, 470.125MHz, 1mW
Operator Name: Juan Castrejon
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)
Date Tested: July 27, 2020

Power Meter Measurement in dBm	Power Meter Measured in mW	Limit in mW	Margin In mW
-0.12	0.97	250.00	249.03

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: Low Frequency, 470.125MHz, 10mW
Operator Name: Juan Castrejon
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)
Date Tested: July 27, 2020

Power Meter Measurement in dBm	Power Meter Measured in mW	Limit in mW	Margin In mW
+10.05	10.12	250.00	239.88



Appendix C

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: Middle Frequency, 502.050MHz, 1mW
Operator Name: Juan Castrejon
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)
Date Tested: July 27, 2020

Power Meter Measurement in dBm	Power Meter Measured in mW	Limit in mW	Margin In mW
-0.47	0.90	250.00	249.10

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: Middle Frequency, 502.050MHz, 10mW
Operator Name: Juan Castrejon
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)
Date Tested: July 27, 2020

Power Meter Measurement in dBm	Power Meter Measured in mW	Limit in mW	Margin In mW
+9.67	9.27	250.00	240.73



Appendix C

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: High Frequency, 534.000MHz, 1mW
Operator Name: Juan Castrejon
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)
Date Tested: July 27, 2020

Power Meter Measurement in dBm	Power Meter Measurement in mW	Limit in mW	Margin In mW
-0.76	0.84	250.00	249.16

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: High Frequency, 534.000MHz, 10mW
Operator Name: Juan Castrejon
Comment: FCC Part 74H, Section 74.861(e)(1)(ii)
Date Tested: July 27, 2020

Power Meter Measurement in dBm	Power Meter Measurement in mW	Limit in mW	Margin In mW
+9.32	8.55	250.00	241.45



Appendix C

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Power Output
Operating Conditions: Low Frequency, 470.125MHz, 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
-0.12	0.97	0.10	-0.02	0.995	250

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

G50 Measured antenna gain = 0.1dB

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: Low Frequency, 470.125MHz, 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
+10.05	10.12	0.10	10.15	10.35	250

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

G50 Measured antenna gain = 0.1dB



Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: Maximum Rated Output
 Operating Conditions: Middle Frequency, 502.050MHz, 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
-0.47	0.90	0.1	-0.37	0.92	250

EIRP = (dBm) = Measurement (dBm) + Antenna gain (dBi)
 G50 Measured antenna gain = 0.1dB

Test Information

EUT Name: QLXD1 G50
 Serial Number: N2
 Test Description: Maximum Rated Output
 Operating Conditions: Middle Frequency, 502.050MHz, 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
+9.67	9.27	0.1	9.77	9.48	250

EIRP = (dBm) = Measurement (dBm) + Antenna Gain (dBi)
 G50 Measured antenna gain = 0.1dB



Appendix C

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: High Frequency, 534.000MHz, 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
-0.76	0.84	0.1	-0.66	0.86	250

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

G50 Measured antenna gain = 0.1dB

Test Information

EUT Name: QLXD1 G50
Serial Number: N2
Test Description: Maximum Rated Output
Operating Conditions: High Frequency, 534.000MHz, 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 dB	RSS-210: EIRP in dBm	RSS-210: EIRP in mW	RSS-210: EIRP LIMIT in mW
+9.32	8.55	0.1	9.42	8.75	250

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

G50 Measured antenna gain = 0.1dB