Engineering Test Report No. SEL-041/QLXD2 G50 FCC74H



SHURE

ELECTROMAGNETIC COMPATIBILITY LABORATORY TEST REPORT

TEST REPORT TITLE: Electromagnetic Compatibility Tests of the Shure QLXD2 Digital Wireless Microphone Transmitter in the G50 Band (470MHz to 534MHz)

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 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: November 10, 2020 Global Compliance Engineer APPROVED BY: November 10, 2020 Manager, Quality Labs Position Date Signature



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LIST OF APPENDICIES

APPENDIX	TEST DESCRIPTION							
А	Operating Bandwidth, 99% Emission Bandwidth							
В	Spurious Emissions							
С	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)
QLXD2	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.

FCC Part 74H Test	Description	EUT Firmware	Tested Frequency in MHz	Appendix	Test Results					
Spec										
74.861(e)(5)	Operation Bandwidth	2.3.22	470.125, 502.050, 534.000	А	Pass					
RSS-210, RSS-Gen	99% Emission Bandwidth	2.3.22	470.125, 502.050, 534.000	А	Pass					
74.861(e)(7)	Spurious Emissions	2.3.22	470.125, 502.050, 534.000	В	Pass					
74.861(e)(1)(ii)	Maximum Rated Power	2.3.22	470.125, 502.050, 534.000	С	Pass					

Table 2. Summary of tests performed



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 MICROPOHONES" 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							
ſ	Band	Serial Numbers						
	G50	1 and N2						

3.3 Operational Mode

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

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

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	±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 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.



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 ISED 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



Test Information

EUT Name: Serial Number: Test Description: Operating Conditions: Operator Name: Comment: Date Tested:

		EN 300 422 Digital Necessary Bandwidth Low Frequency, 470.125MHz, 1mW Juan Castrejon									
		-									
		: Step 1; Cai	rier Powe	er							
	July 27,	, 2020									
MultiView 🕀 Spectrum	Spectrum 2	Spectrum 3	X			▼					
RefLevel 15.00 dBm Offset 20 Att 5 dB = SWT	0.33 dB • RBW 1 MHz 3 s • VBW 1 MHz					SGL Count 5/5					
l Zero Span					N 10	• 1Rm Avg 1[1] -0.18 dBm					
10 dBm						1.47600 s					
		MI									
) dBm		*									
10 d8m											
10 000											
20 dBm											
30 dBm											
40 dBm-					-						
50 d8m											
50 dem-											
60 d8m											
70 d8m											
eo dem											
CF 470.125 MHz	1	1001 pts		-		300.0 ms/					
J				Ready	0000000 🦇	27.07.2020 17:19:23					

QLXD2 G50

N2

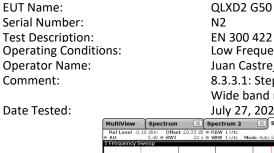
Test Information

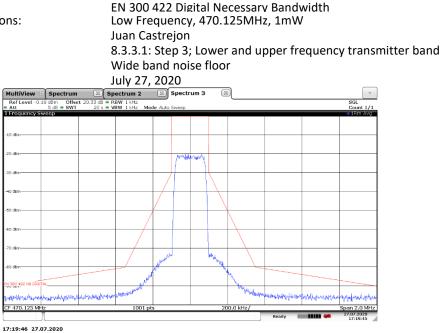
	EUT Name: Serial Number: Test Description: Operating Conditio Operator Name: Comment:	Juan Castrejon 8.3.3.1: Step 2; Maximum Relative Level	
Date Tested: July 27, 2020			
RefLevel -0.18 dBm Offset 20.33 dB @ RBW 1 kHz SGL		Ref Level -0.18 dBm Offset 20.33 dB • RBW 1 kHz	SGL
■ Att 5 d5 = SWT 3 5 = VBW 1 bHz Mode Auto Sweep Count 1/1 IFrequency Sweep ● 18m Mox		1 Frequency Sweep	1Rm Max
M1[1] - 98.39 dBm 471.12300 MHz		MI	
-10 dBm-	-1	-10 dBm-	
20 dta			
AL (MA) AL (MA	~2		
-30 dłm	-3	-30 dēm	
42 dtm	-4	-40 dim	
-50 dbm		-50 dBm	
-00 d8m	-6	-60 d8m	
-70 dkm	-7	-70 dBm-	
40 dim	-8	-80 dim	
94, 500, 542 He DIGTAL		SN 300 1/22 NB DIGTTAL	
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CF 470.125 MHz 1001 pts 200.0 kHz/ Span 2.0 MHz 27.07.2020 Ready 1001 pts 200.0 kHz/ Span 2.0 MHz 27.07.2020	ci		27.07.2020

17:19:36 27.07.2020



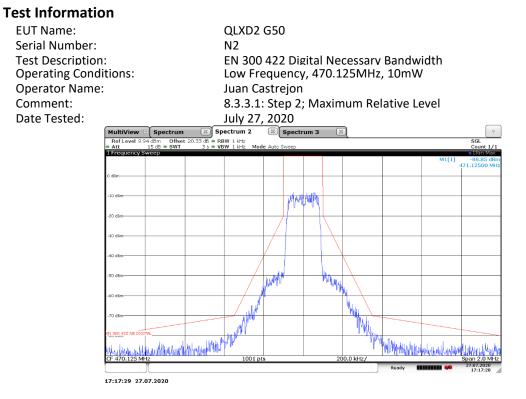
Test Information EUT Name:





EUT Name: Serial Number: Test Description: Operating Condit Operator Name: Comment: Date Tested:										
	MultiView 😁	Spectrum		trum 2	Spectr	rum 3	X			
	Ref Level 15.0 Att	odBm Offset 5dB●SWT	20.33 dB • RBV				_		SGL Count 5/3	5
	1 Zero Span								●1Rm Avg M1[1] 9.94 dB	
	-10-d8m								894.00 n	
	0 dBm									
	-10 dBm						_			-
	-20 d8m									
	-20 dbm									
	-30 dBm									_
	-40 dBm									_
	-50 dBm						_			_
	-60 dBm									-
	-70 d8m									
	-80 d8m									-
	CF 470.125 MHz				1001	i pts			300.0 ms	Σ
								Ready IIII	40 27.07.2020 17:17:11	lla
	17:17:12 27.0	7.2020								





E 1 I E 1					~ - ~								
EUT Name:				QLXD2	G50								
Serial Number:				N2									
Test Description:			I	EN 300	422	Dig	ital	Ne	cessar	y Band	width		
Operating Conditi	ons:		I	Low Fre	eque	ncy	, 47	0.1	.25MH	z, 10m'	W		
Operator Name:				Juan Ca	istre	jon							
Comment:							Lov	ver	and u	pper fr	equency	/ transn	nitter band
				Wide b									
Date Tested:				July 27,				001					
Date resteu.	MultiView	Spectrum		ectrum 2		Spectru	IM 3	23				▽	
	Ref Level 9. Att		t 20.33 dB • RI		le Auto Si	- Weep						SGL Count 1/1	
	1 Frequency S											●1Rm Avg	
	0 dBm-												
	-10 dBm-					Allow	welly						
	-20 d8m						-						
	-30 dBm							\backslash					
	-50 08/1												
	-40 d8m			/	/								
	-50 d8m			/	and a			ja,	λ				
					Marwar			- YON					
	-60 dBm												
	-70 dBm								"hug				
	EN 300 422 NB DIG	ITAL		AND A					Nr.				
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	CF 470.125 M	applicate war and	10 P	1001 pt				- 20	0.0 kHz/	1	Line Cost whith we.	Span 2.0 MHz	



300.0 ms 27.07.2020 17:22:35

Appendix A

Test Information

EUT Name:
Serial Number:
Test Description:
Operating Conditions:
Operator Name:
Comment:
Date Tested:

ectrum m Offse B ⊕ SWT	Offset 20.42 dB RBW 1 MHz SGL									
							M1	[1] -0.21 dBm 1.96500 s		
					M1					

1001 pt

17:22:35 27.07.2020

CF 502.05 M

Spe

MultiView

Att

o de

Test Information

-											
		(QLXD2	G50							
			N2								
		1	EN 300	422	Dia	zita	l Ne	cessarv	/ Bandy	vidth	
onci						-					
0115.							, 50	2.0501	/IEZ, 111	100	
		8	8.3.3.1:	Ste	p 2	; M	axin	num Re	lative L	evel	
			luly 27,	202	20						
MultiView					Spectr	um 3	(X	D			
Att	5 dB • SWT	et 20.42 dB ● R 3 s ● V	BW 1kHz BW 1kHz Mo	de Auto:	Sweep						SGL Count 1/1
I frequency s	veep									M1[1]	-99.84 dBm 501.05000 MHz
-10 dBm											
-20 d8m-					MAY	111					
-30 dBm					1		Ļ—				
10.00				/	1		$\langle \cdot \rangle$				
-40 dBm											
-50 d8m			/	(-			(
-60.d8m								\backslash			
-70 dBm							61.1				
-80 d8m				M			WHY .				
			, all	<i>8</i> .			10	Mr.			
EN 300 422 NB DIGIT	AL	المريد المرا	LAAL HAVE					Thur has been	ALMO LA CA		
article Mander	MANN	ANNA, MAR	WIW.					- Tright	r pratiki kali k	Mandall	ALMAN AND A
CF 302.05 MHz			1001 pt	5			21		Ready		27.07.2020 17:23:04
	Part Level - 0.2 • Alt • Alt • I = frequency St • 10 dbn • 20 dbn • 20 dbn • 40 dbn • 40 dbn • 60 dbn	MultiView Spectrum Rel Level -0.21 dbm Offs Att Offs 1 frequency Sweep 9 WI 10 dbm	ONS:	N2 EN 300 ons: Middle Juan Ca 8.3.3.1: July 27, Multiview Spectrum 2 Spectrum 2 Spectrum 2 Att Sold and the state of the	N2 EN 300 422 Middle Free Juan Castre 8.3.3.1: Ste July 27, 202 Multiview Spectrum 2 Sector 2 30 VBU 1612 Middle Free July 27, 202 Sector 2 30 VBU 1612 Middle Free July 27, 202 Sector 2 30 VBU 1612 Middle Auto 1 Freevency Sweet 1 Freevency Sweet 1 Freevency Sweet 1 Gen 40 den 40 den	Spectrum 2 S	N2 EN 300 422 Digita Middle Frequency Juan Castrejon 8.3.3.1: Step 2; Mi July 27, 2020 Multiview Spectrum 2 For Level-0.2: doi: 0.016 0.02 de 800 Hit at the control of the other states of the other states of the other at the control of the other states of the other	N2 EN 300 422 Digital Ne Middle Frequency, 50 Juan Castrejon 8.3.3.1: Step 2; Maxin July 27, 2020	N2 EN 300 422 Digital Necessary Middle Frequency, 502.050N Juan Castrejon 8.3.3.1: Step 2; Maximum Re July 27, 2020 Multiview Spectrum S Spectrum 2 Spectrum 3 C Part Level - 2: Construction of Step 2: 2: Construction of Step 2: Construction of St	N2 EN 300 422 Digital Necessary Bandw Middle Frequency, 502.050MHz, 1n Juan Castrejon 8.3.3.1: Step 2; Maximum Relative L July 27, 2020 Multiview Spectrum Spectrum Spectrum 3 Ref Level -0.21 Step Offer 20-28 + RBW 11412 Base BW 1242 - 20 - 20 - 20 - 20 - 20 - 20 - 20 -	N2 EN 300 422 Digital Necessary Bandwidth Middle Frequency, 502.050MHz, 1mW Juan Castrejon 8.3.3.1: Step 2; Maximum Relative Level July 27, 2020 Multiver Spectrum Spectrum 2 Spectrum 3 S Ref Level -0.2 Cm Will be Mede Acto Sweet Transmission of the Step 2 Ste

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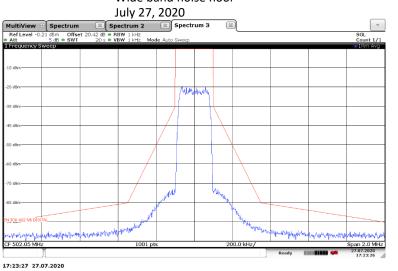


Test Information

EUT Name:
Serial Number:
Test Description:
Operating Conditions:
Operator Name:
Comment:

QLXD2 G50 N2 EN 300 422 Digital Necessarv Bandwidth Middle Frequency, 502.050MHz, 1mW Juan Castrejon 8.3.3.1: Step 3; Lower and upper frequency transmitter band Wide band noise floor



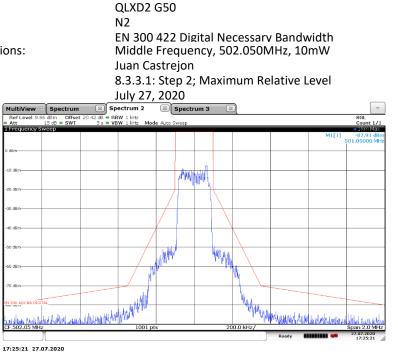


EUT Name:QLXD2 G50Serial Number:N2Test Description:EN 300 422 Digital NecessaryOperating Conditions:Middle Frequency, 502.050MIOperator Name:Juan CastrejonComment:8.3.3.1: Step 1; Carrier PowerDate Tested:July 27, 2020	
MultiView 🕀 Spectrum 🖾 Spectrum 2 🖾 Spectrum 3 🖾	
RefLevel 15.00 dBm Offset 20.42 dB ■ RBW 1 MHz ● Att 5 dB SWT 3 s ● VBW 1 MHz	SGL Count 5/5
1 Zero Span	• 1Rm Avg M1[1] 9.86 dBm 1.78500 s
-10 d8m *	
0 d8m	
-10 dkm	
*10 DBH	
-20 dBm	
-30 den	
-40 d0m	
-50 dbm	
-60 dbm	
00 000	
-70 d8m	
-80 d8m	
CF 502.05 MHz 1001 pts	300.0 ms/
	Ready 27.07.2020
17:25:08 27.07.2020	



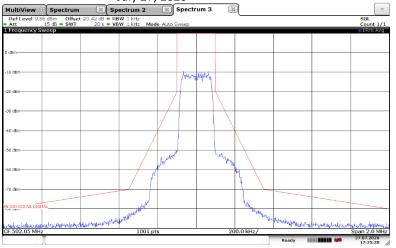
Test Information

EUT Name: Serial Number: Test Description: Operating Conditions: Operator Name: Comment: Date Tested:



Test Information

EUT Name:	QLXD2 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 3; Lower and upper frequency transmitter band
	Wide band noise floor
Date Tested:	July 27, 2020



17:25:30 27.07.2020



Test Information

EUT Name: Serial Number: Test Description: Operating Conditions: Operator Name: Comment: Date Tested:

ons:	N2 EN 300 422 Digital Necessarv Bandwidth High Frequency, 534.000MHz, 1mW Juan Castrejon 8.3.3.1: Step 1; Carrier Power							
MultiView 🗄 Spectrur	July 27,	2020	X	~				
RefLevel 15.00 dBm Off Att 5 dB • SW	set 20.45 dB • RBW 1 MHz	Spectrum 3		SGL Count 5/5				
1 Zero Span				IRm Avg M1[1] -0.63 dBm 2.08200 s				
0 dBm			м					
0.001								
-10 dBm								
-20 dBm								
30 dBm								
40 dBm-								
50 dBm								
60 dBm								
70 dBm								
-80 dBm		1001 pts		300.0 ms/				
Y			Ready	27.07.2020 17:30:21				

QLXD2 G50

estimormation										
EUT Name:			QLXD2 (G50						
Serial Number:			N2							
Test Description: Operating Conditi	ons:		EN 300 High Fre							
Operator Name:			Juan Ca	strej	on					
Comment:			8.3.3.1:	Step) 2; M	axin	num Re	lative	Level	
Date Tested:			July 27,							
	MultiView	Spectrum	Spectrum 2		ectrum 3	2	3			~
	Ref Level -0.6 Att	5 dB = SWT	1.45 dB ● RBW 1 kHz 3 s ● VBW 1 kHz Mod	e Auto Sw	leep					SGL Count 1/1
	1 Frequency Sv	veep							M1[1]	 1Rm Max -96.58 dBm 533.00000 MHz
	-10 dBm-									533.00000 MHz
	-20 dBm			1	WWWW					
	-30 dBm				_	\leftarrow				
	-40 dBm					\backslash				
				/ ($\langle \rangle$				
	-50 dBm									
	-60 dBm						\backslash			
	-70 dBm			lo ad		hu.				
	-60 dBm			the state of the s		^{- uu} h _h h				
	EN 300 422 NB DIGIT			10		1	M.			
	h June Aller Lud	Honoral Markel 10/174	WAR WARDAN SHAPPAN				Marwh	NAMANAM	KALALAWANTAK	orbothantan
	CF 534.0 MHz		1001 pts			20	00.0 kHz/			Span 2.0 MHz 27.07.2020
	17:30:40 27.0	7 2020					ļ	Ready 📕		17:30:39
	17.30.40 27.0	1.2020								

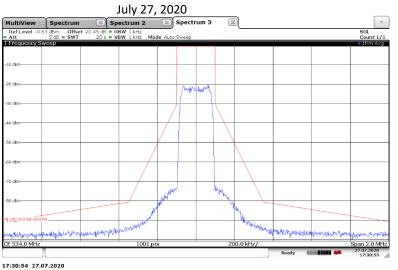


Test Information

EUT Name:
Serial Number:
Test Description:
Operating Conditions:
Operator Name:
Comment:

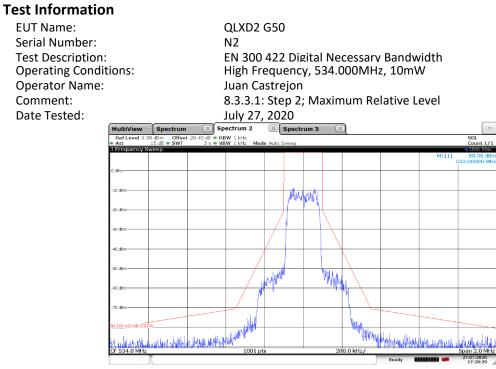
QLXD2 G50 N2 EN 300 422 Digital Necessarv Bandwidth High Frequency, 534.000MHz, 1mW Juan Castrejon 8.3.3.1: Step 3; Lower and upper frequency transmitter band Wide band noise floor





EUT Name: Serial Number: Test Description: Operating Condit Operator Name: Comment:	on: EN 300 422 Digital Necessary Bandwidth ditions: High Frequency, 534.000MHz, 10mW							
Date Tested:		~		7, 2020				
	Ref Level 15.	Spectrum	20.45 dB • RBW 1 MHz	Spectrum 🖾	13 🗵			SGL
	Att 1 Zero Span	5 dB 🖷 SWT	3 s 🗢 VBW 1 MHz					Count 5/5 IRm Avg
	10 d8m						M1[1]] 9.38 dBm 2.66100 s
	0 dBm-							
	-10 dBm							
	-20 dBm-							
	-30 d8m							
	-40 dBm							
	-50 dBm							
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	-60 dBm							
	-70 dBm							
	o d dani							
	-80 dBm							
	CF 534.0 MHz			1001 pt	s			300.0 ms/
						Ready	0000000 🖗 2	17:28:23
	17:28:24 27.0	7.2020						





17:28:39 27.07.2020

EUT Name:	QLXD2 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
comment.	Wide band noise floor
Date Tested:	July 27, 2020
MultiView 🗄 Spectrum 🖾	Spectrum 2 Spectrum 3 🗷
	VBW 1 kHz Mode Auto Sweep Count 1/1
1 Frequency Sweep	e îRm Avg
0 d0m	
-10 dBm-	
	and the second s
-20 dbm	
-30 dBm-	
-40 dBm	
-50 dBm	
	Multime Manue
-60 dbm	
-70 dBm	
EN 300 422 NE DIGITAL	
and the second state of th	1001 pts 200.0 Htz
CF 534.0 MHz	1001 pts 200.0 kHz/ Span 2.0 MHz Ready Ready 17.28-18
17:28:49 27.07.2020	17.20.40 @



RSS-210, RSS-Gen 99% Emissions Bandwidth

QLXD2 Unit # N2	Frequency in MHz	Measured 99% BW (kHz)	RSS-210 Limit (kHz)
	470.125	162.91	200
	502.050	162.50	200
	534.000	162.52	200

RF Power Output set to 10 mW

Tested by Juan Castrejon, November 9, 2020



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.

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	4.56 dB	6.00 dB

Values of Expanded Measurement Uncertainty (95% Confidence)

site or alternative test site) (1 GHz – 13 GHz) 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:

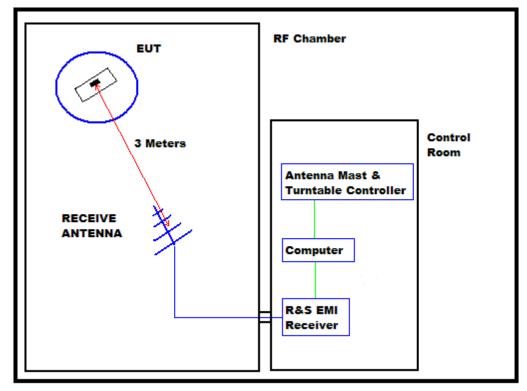
A Shure microphone was plugged into the EUT. The EUT was powered up and the frequency of the transmitter was selected using the front panel controls. The EUT was checked for proper operation after it was setup on the test table. For radiated spurious emissions the testing was performed with the EUT set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



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.



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



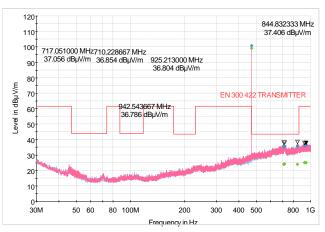
Common Information

Test Description:
EUT:
Serial Number:
Operating Frequency:
RF Power Level
Tester Name:
Date Tested

FCC 74H Radiated Emissions 30MHz - 1GHz QLXD2 G50 1 Low Frequency 470.125MHz 1mW Craig Kozokar July 31, 2020, 74F 42% RH

SHURE Radiated RF Emissions Test Report

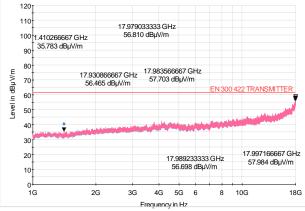
Full Spectrum



SHURE Radiated RF Emissions Test Report

Common Information

Test Description: EUT: Serial Number: Operating Frequency: RF Power Level Tester Name: Date Tested FCC 74H Radiated Emissions 1GHz - 6GHz QLXD2 G50 1 Low frequency 470.125MHz 1mW Sharjeel Sohail August 12, 2020, 74F 39% RH Full Spectrum





SHURE Radiated RF Emissions Test Report

Common Information

Test Description:
EUT:
Serial Number:
Operating Frequency:
RF Power Level
Tester Name:
Date Tested

Common Information Test Description:

Operating Frequency:

Serial Number:

RF Power Level

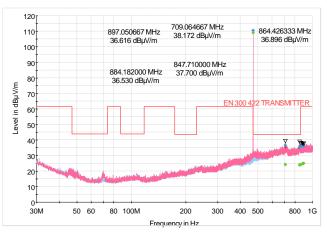
Tester Name:

Date Tested

EUT:

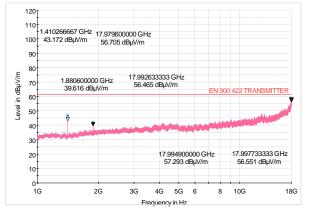
FCC 74H Radiated Emissions 30MHz - 1GHz QLXD2 G50 1 Low Frequency 470.125MHz 10mW Craig Kozokar July 31, 2020, 74F 42% RH

Full Spectrum



SHURE Radiated RF Emissions Test Report

FCC 74H Radiated Emissions 1GHz - 6GHz QLXD2 G50 1 Low Frequency 470.125MHz 10mW Sharjeel Sohail August 12, 2020, 75F 37% RH Full Spectrum

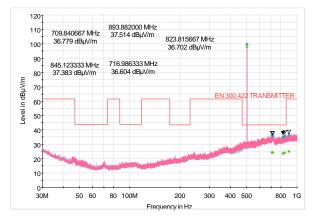




Common Information

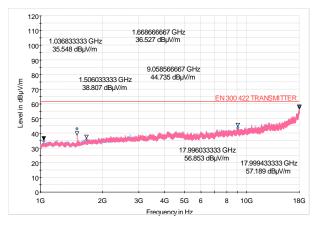
Test Description: EUT: Serial Number: Operating Frequency: RF Power Level Tester Name: Date Tested FCC 74H Radiated Emissions 30MHz - 1GHz QLXD2 G50 1 Middle Frequency 502.050MHz 1mW Craig Kozokar July 31, 2020, 74F 42% RH Full Spectrum

SHURE Radiated RF Emissions Test Report



SHURE Radiated RF Emissions Test Report

FCC 74H Radiated Emissions 1GHz - 6GHz QLXD2 G50 1 Middle Frequency 502.050MHz 1mW Sharjeel Sohail August 14, 2020, 74F 38% RH Full Spectrum



Common Information

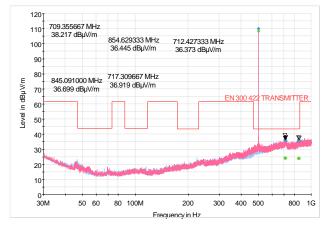
Test Description: EUT: Serial Number: Operating Frequency: RF Power Level Tester Name: Date Tested



SHURE Radiated RF Emissions Test Report

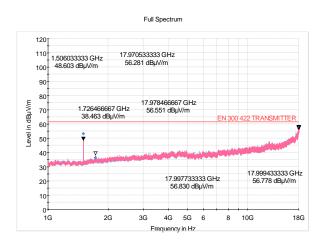
Common Information

Test Description: EUT Serial Number Operating Frequency: RF Power Level Tester Name Date Tested FCC 74H Radiated Emissions 30MHz - 1GHz QLXD2 G50 1 Middle Frequency 502.050MHz 10mW Craig Kozokar July 31, 2020, 74F 38% RH Full Spectrum



SHURE Radiated RF Emissions Test Report

FCC 74H Radiated Emissions 1GHz - 6GHz QLXD2 G50 1 Middle Frequency 502.050MHz 10mW Sharjeel Sohail August 12, 2020, 74F 38% RH



Common Information

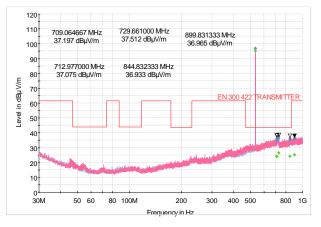
Test Description: EUT: Serial Number: Operating Frequency: RF Power Level Tester Name: Date Tested



Common Information

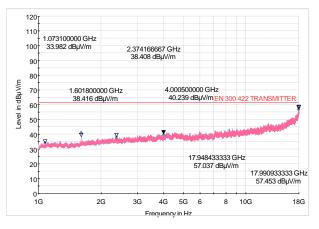
Test Description: EUT Serial Number Operating Frequency: RF Power Level Tester Name Date Tested FCC 74H Radiated Emissions 30MHz - 1GHz QLXD2 G50 1 High Frequency 534.000MHz 1mW Craig Kozokar July 31, 2020, 74F 42% RH Full Spectrum

SHURE Radiated RF Emissions Test Report



SHURE Radiated RF Emissions Test Report

FCC 74H Radiated Emissions 1GHz - 6GHz QLXD2 G50 1 High Frequency 534.000MHz 1mW Sharjeel Sohail August 12, 2020, 75F 37% RH Full Spectrum



Common Information

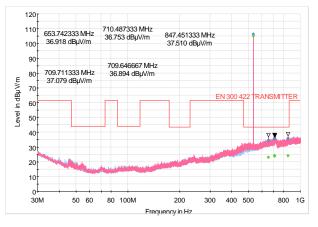
Test Description: EUT: Serial Number: Operating Frequency: RF Power Level Tester Name: Date Tested



Common Information

Test Description: EUT Serial Number Operating Frequency: RF Power Level Tester Name Date Tested FCC 74H Radiated Emissions 30MHz - 1GHz QLXD2 G50 1 High Frequency 534.000MHz 10mW Craig Kozokar July 31, 2020, 74F 42% RH Full Spectrum

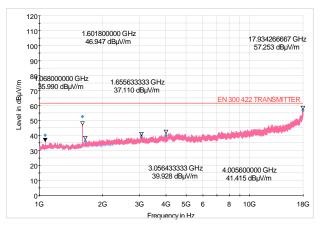
SHURE Radiated RF Emissions Test Report



SHURE Radiated RF Emissions Test Report

FCC 74H Radiated Emissions 1GHz - 6GHz QLXD2 G50 1 High Frequency 534.000MHz 10mW Sharjeel Sohail August 12, 2020, 75F 38% RH

Full Spectrum



Common Information

Test Description: EUT: Serial Number: Operating Frequency: RF Power Level Tester Name: Date Tested



Date:	September 9, 2020
EUT:	QLXD2
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
1410.267	Average	V	46.67	-50.01	5.26	3.92	-48.67	-30.00	18.67
1880.600	Average	V	41.99	-67.13	4.86	4.54	-66.82	-30.00	36.82

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

Date:	September 9, 2020
EUT:	QLXD2
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
1506.033	Average	V	53.06	-44.60	6.11	4.08	-42.57	-30.00	12.57
1726.467	Average	V	36.23	-65.68	5.55	4.34	-64.47	-30.00	34.47

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



Date:	September 9, 2020
EUT:	QLXD2
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	40.10	-52.26	3.37	3.65	-52.54	-30.00	22.54
1601.800	Average	V	52.58	-44.06	6.19	4.26	-42.13	-30.00	12.13
1655.633	Average	V	36.12	-73.29	5.96	4.35	-71.69	-30.00	41.69
3056.433	Average	V	39.53	-61.91	7.11	5.53	-60.33	-30.00	30.33
4005.600	Average	V	40.10	-72.56	8.91	6.67	-70.32	-30.00	40.32



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

 $U_{\text{lab}\,\text{=}}$ 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.



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 35 thru page 40.

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



Figure C 1: Test setup for Maximum Power Output



Test Information

EUT Name:	QLXD2 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
-0.20	0.95	250.00	249.05

EUT Name:	QLXD2 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
+9.92	8.82	250.00	241.18



Test Information

EUT Name:QLXD2 G50Serial Number:N2Test Description:Maximum Rated OutputOperating Conditions:Middle Frequency, 502.050MHz, 1mWOperator Name:Juan CastrejonComment: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
-0.26	0.94	250.00	249.06

Test Information

EUT Name: Serial Number: Test Description: Operating Conditions: Operator Name: Comment: Date Tested: QLXD2 G50 N2 Maximum Rated Output Middle Frequency, 502.050MHz, 10mW Juan Castrejon FCC Part 74H, Section 74.861(e)(1)(ii) July 27, 2020

Power Meter Measurement in dBm	Power Meter Measured in mW	Limit in mW	Margin In mW
+9.84	9.64	250.00	240.36



Test Information

Serial Number:

Test Description:

Operator Name:

Operating Conditions:

EUT Name:

Comment: Date Tested: QLXD1 G50 N2 Maximum Rated Output High Frequency, 534.000MHz, 1mW Juan Castrejon FCC Part 74H, Section 74.861(e)(1)(ii) July 27, 2020

Power Meter Measurement in dBm	Power Meter Measurement in mW	Limit in mW	Margin In mW
-0.67	0.86	250.00	249.14

Test Information

EUT Name: Serial Number: Test Description: Operating Conditions: Operator Name: Comment: Date Tested: QLXD2 G50 N2 Maximum Rated Output High Frequency, 534.000MHz, 10mW Juan Castrejon FCC Part 74H, Section 74.861(e)(1)(ii) July 27, 2020

Power Meter Measurement in dBm	Power Meter Measurement in mW	Limit in mW	Margin In mW
+9.36	8.64	250.00	241.36



Test Information

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
-0.20	0.95	-0.6	-0.80	0.83	250

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

G50 Measured antenna gain = -0.6dBi

Test Information

EUT Name:	QLXD2 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
+9.92	9.82	-0.60	9.32	8.55	250

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

G50 Measured antenna gain = -0.6dBi



Test Information

EUT Name:	QLXD2 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
-0.26	0.94	-0.6	-0.86	0.82	250

EIRP = (dBm) = Measurement (dBm) + Antenna Gain + Equivalent Antenna Gain (dB) G50 Measured antenna gain = -0.6dBi

Test Information

EUT Name:	QLXD2 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
+9.84	9.64	-0.6	9.24	8.40	250

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

G50 Measured antenna gain = -0.6dB



Test Information

EUT Name:	QLXD2 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
-0.67	0.86	-0.6	-1.27	0.75	250

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

G50 Measured antenna gain = -0.6dB

Test Information

EUT Name:	QLXD2 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 dBi	RSS-210: EIRP in dBm	RSS-210: EIRP in mW	RSS-210: EIRP LIMIT in mW
+9.36	8.63	-0.6	8.76	7.52	250

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

G50 Measured antenna gain = -0.6dBi