Electromagnetic Compatibility Laboratory Test Report

Test Report Title:	Electromagnetic Compatibility Tests for Shure P10T – J8A Transmitter
Test Item Description:	P10T is a full-rack, dual channel wireless transmitter housed in a touring-grade, all-metal chassis. The system operates in the J8A band (554 to 616 MHz) and is networkable over Ethernet connection. The P10T operates on AC power.
For:	Shure Incorporated 5800 West Touhy Avenue Niles, IL 60714
Project ID Number:	SEL-040
Dates Tested:	11/04/2018 to 11/12/2018
Test Personnel:	Tom Braxton, Juan Castrejon, Hannah Hart, Jamal Qureshi
Test Specification:	FCC Part 74 RSS 210.9

TEST REPORT BY:	SIGNATURE	Compliance Engineer POSITION	11/13/2018 DATE
APPROVED BY:	SIGNATURE	Engineer Project Managing POSITION	11/13/2018 DATE

SAFETY ENVIRONMENT TEST EDUCATE APPROVE GLOBAL COMPLIANCE

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Appendix	Test Description
A	Radiated Emissions
B	Necessary Bandwidth
C	RF Output Power

Report Revision History

Revision	Date	Description
0	11/13/2018	Released for use

Report Summary

1. Introduction

1.1. Scope of Tests

This document presents the results of a series of electromagnetic compatibility (EMC) tests performed on the Shure P10T – J8A Transmitter. The test items were manufactured and submitted for testing by Shure Incorporated located in Niles, IL. The data was taken following the measurement methods as described in the test specifications listed on page 1 of this document. Provided is the data for the test samples which also includes a summary of the measurements made and a description of the measurement setup.

1.2. Purpose

This series of tests was performed to determine if the test item would meet the selected requirements of the following specifications:

FCC Part 74

RSS 210.9

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 ISED 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 were performed on the test item in accordance with the specifications as stated in the following:

FCC Part 74

RSS 210.9 Annex G

Table 1-1: Summary of tests performed

Test Specifications	Description	Tested Range	Described in Appendix	Test Results
FCC Part 74.861 RSS 210.9 Annex G	Field Strength Spurious Emissions	554.000 MHz – 615.875 MHz	A	PASS
FCC Part 74.861 RSS 210.9 Annex G	Necessary Bandwidth	554.000 MHz – 615.875 MHz	B	PASS
FCC Part 74.861 RSS 210.9 Annex G	RF Output Power	554.000 MHz – 615.875 MHz	C	PASS

2. Applicable Documents

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

- RSS 210.9

- FCC Part 74

3. EUT Set-Up and Operation

3.1. General Description

3.2. Test Samples

The following Shure P10T – J8A Transmitter samples were tested:

Table 3-1: Transmitter Samples

Frequency Band	RF Power Output In mW	EUT Serial Number
J8A	100	#1

3.3. Test Setup

3.3.1. Power Input

The EUT obtained power through internal power supply.

3.3.2. Signal Input /Output Leads

3.3.3. Grounding Considerations

3.3.4. Operational Mode

4. Test Instrumentation

A list of the test equipment used can be found in **Error! Reference source not found.**. All equipment is calibrated on an annual/semiannual basis depending on component critical status. All calibrations are traceable to the National Institute of Standards and Technology (NIST).

5. Test Procedures

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

The results are presented in the individual test appendices. It was found that the EUT met the requirements of the following:

FCC Part 74
RSS 210.9

8. Conclusions

It was determined that the Shure P10T – J8A Transmitter did fully comply with the requirements of the following:

FCC Part 74

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	8/8/2017	8/8/2018
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	6/22/2017	6/22/2018
L23-011-44	BiConiLog Antenna	ETS Lindgren	3142C	79899	25MHz-1GHz	2/27/2017	2/27/2018
L23-011-54	EMI Test Receiver	Rohde & Schwarz	ESR26	100220	9kHz-26GHz	3/30/2017	3/30/2018
L23-011-31	EMI/EMS Test Software	Rohde & Schwarz	EMC32	V 9.21.00	N/A	N/A	N/A
L23-011-55	Horn antenna with pre-amplifier	ETS Lindgren	3117-PA	206583	1GHz to 18 GHz	4/27/2017	4/27/2018
L23-011-41	Horn Antenna	ETS Lindgren	3117	123511	1GHz to 18 GHz	5/7/2017	5/7/2018
L23-011-57	High Pass Filter	K&L	11SH10-940/X10000-0/0	3	940MHz – 10GHz	3/31/2017	3/31/2018
L23-022-02	Spectrum Analyzer	Rohde & Schwarz	FSW26	103788	9kHz-26GHz	3/28/2017	3/28/2018
L23-022-01	Spectrum Analyzer	Rohde & Schwarz	FSU26	201043	9kHz-26GHz	8/23/2017	8/23/2018
L23-040-09	20dB attenuator	Mini-Circuits	BW-S20W2	N/A	20MHz to 18GHz	2/21/2017	2/21/2018
L23-040-04	20dB attenuator	Mini-Circuits	BW-S20W5	1133	20MHz to 18GHz	7/18/2017	7/18/2018
L23-034-05	Temperature Hygrometer	Extech	445703	48254-66	N/A	9/15/2016	9/15/2018
L23-034-04	Temperature Hygrometer	Extech	445703	48254-13	N/A	9/15/2016	9/15/2018
L23-023-01	RF Signal Generator	Rohde & Schwarz	SMF100A	101553	20Hz to 26.5GHz	8/23/2017	8/23/2018

Appendix A: Radiated Emissions Measurements

A.1. Purpose:

This test was performed to determine if the EUT (Shure P10T X55 Transmitter) meets the Radiated Emissions requirements of FCC Part 74.861 (e)(7) and RSS 210.9 Annex G.

A.2. Requirements:

FCC Part 74.861 (e)(7) states:

"Beyond one megahertz below and above the carrier frequency, emissions shall comply with the limits specified in section 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08)."

RSS 210.9 Annex G.3.4 states:

"The transmitter unwanted emissions shall meet the requirements in sections 8.3 and 8.4 of ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and radio spectrum matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; Part 1: Technical characteristics and methods of measurement."

The limits for spurious emissions from a transmitter as stated by EN 300 422-1 v1.4.2 section 8.4 are shown below.

State	Frequency		
	47 MHz to 74 MHz 87,5 MHz to 137 MHz 174 MHz to 230 MHz 470 MHz to 862 MHz	Other Frequencies below 1 000 MHz	Frequencies above 1 000 MHz
Operation	4 nW	250 nW	1 µW
Standby	2 nW	2 nW	20 nW

Figure 1: Table - Limits for Spurious Emissions

A.3. 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_{FCC}
Radiated disturbance (electric field strength on an open area test site or alternative test site) (30 MHz – 1000 MHz)	4.12dB	6dB
Radiated disturbance (electric field strength on an open area test site or alternative test site) (1 GHz – 12.75 GHz)	4.56dB	6dB

U_{LAB} = Determined for Shure EMC Laboratory
U_{FCC} = From FCC EN 300 422-1 Table 10: Measurement uncertainty
Since U_{LAB} is less than or equal to U_{FCC}:

- 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.

A.4. Test Setup and Instrumentation:

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

A.5. EUT Operation:

All ports were terminated on the EUT. The device was powered up and the frequency was set using the buttons on the front panel, with TX1 RF turned on and TX2 RF turned on. Testing was conducted with the EUT set to a middle frequency chosen within the operating frequency range of 581.000MHz. The device was plugged into power from an outlet in the floor of the Shure EMC Lab anechoic chamber.

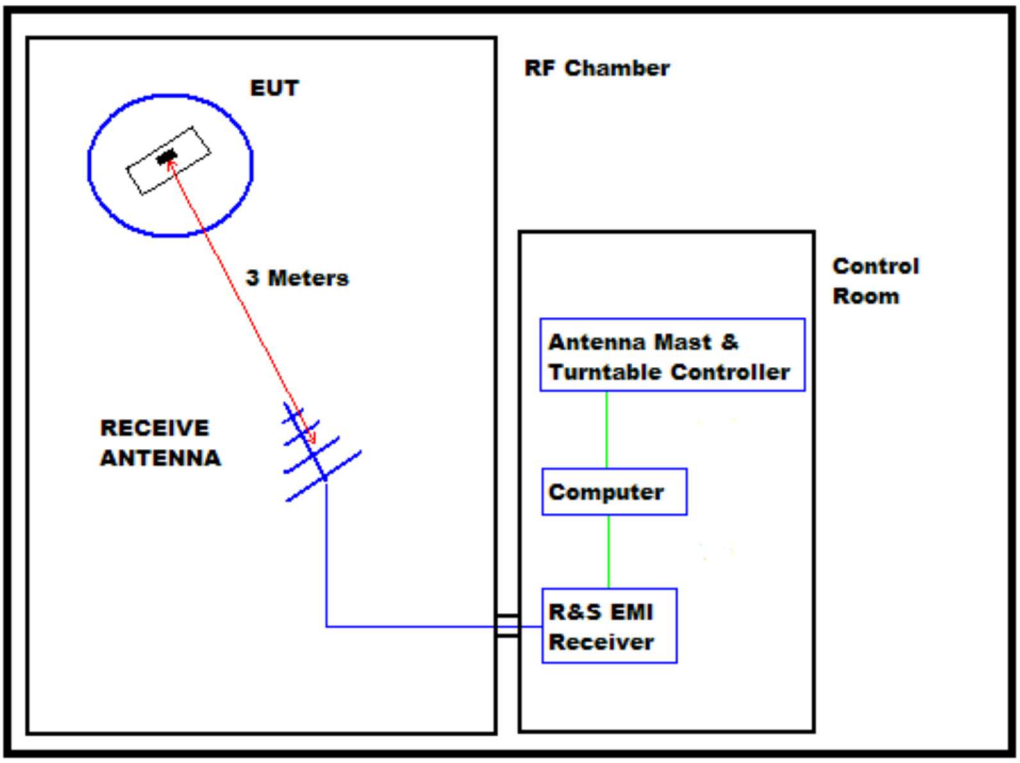
For the tests above 1GHz, a high-pass filter with a cutoff frequency of 1340MHz (L23-011-38) was used to clean up the signal. It was attached immediately after the antenna.

A.6. 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 C63.4-2003 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. The broadband measuring antenna was positioned at a 3 meter distance from the EUT. The frequency range from 25MHz to 1GHz was investigated using a peak detector function with the BiConiLog antenna at horizontal and vertical polarization, and with several different orientations of the EUT with respect to the antenna. The maximum levels measured for each antenna polarization were then automatically plotted. The resultant field strength (FS) is a summation in decibels (dB) of the EMI receiver measurement (ERM), the antenna correction factor (AF), and the cable loss factor (CF). If an external pre-amplifier is used, the total is reduced by its gain (-PA).

Formula 1: FS (dBµV/m) = MTR (dBµV) + AF (dB/m) + CF (dB) + (- PA (dB))

To convert the Field Strength dBµV/m term to µV/m, the dBµV/m is first divided by 20. The Base 10 AntiLog is taken of this quotient. The result is the Field Strength value in µV/m terms.

Formula 2: FS (µV/m) = AntiLog [(FS (dBµV/m))/20]

Final radiated RF emissions were performed on all significant broadband and narrowband emissions found in the preliminary sweeps using the following methods:

1) Measurements of all significant broadband and narrowband signals from 25MHz to 1GHz were made using a quasi-peak detector and a BiConiLog antenna. Measurements above 1GHz were made using an average detector and a broadband double ridged waveguide antenna.

2) To ensure that maximum or worst case, emission levels were measured, the following steps were taken:

i. The EUT was rotated so that all of its sides were exposed to the receiving antenna.

ii. Since the measuring antenna is 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.

Results:

The plots of the radiated spurious emission levels are presented on the following pages. The two data points closest to the limit line were calculated using substitution data and found to pass the test. Calculation is shown

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	FCC 74H Radiated Emissions 1GHz - 7GHz
EUT:	P10TB J8
Serial Number:	382F31970
Project Name:	
Operating Frequency:	Channel 1: 581.000MHz, Channel 2: 581.000MHz
Power Level / Mod Mode:	100mW
EUT Configuration:	Channel 1 RF ON, Chennel 2 RF ON. All ports loaded & heaphones connected.
Name:	Jamal Qureshi
Date Tested	November 2, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC74-EN300422 Transmitter 1GHz to 10GHz 3117-PA 200363

Hardware Setup:	Electric Field Strength 3117-PA 200363 2017 10 17
Measurement Type:	Open-Area-Test-Site
Frequency Range:	1 GHz - 7 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	COMPLIANCE TEST EN300422 Transmitter 1-18 GHz 3117-PA 200363 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 MAX

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 1 to 18 GHz 3117-PA 200363 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
1 GHz - 18 GHz	250 kHz	AVG	1 MHz	1 s	0 dB

Hardware Setup: EMI radiated\Electric Field Strength 3117-PA 200363 2017 10 17 - [EMI radiated]

Subrange 1

Frequency Range:	1 GHz - 18 GHz
Receiver:	ESR 26 [ESR 26]

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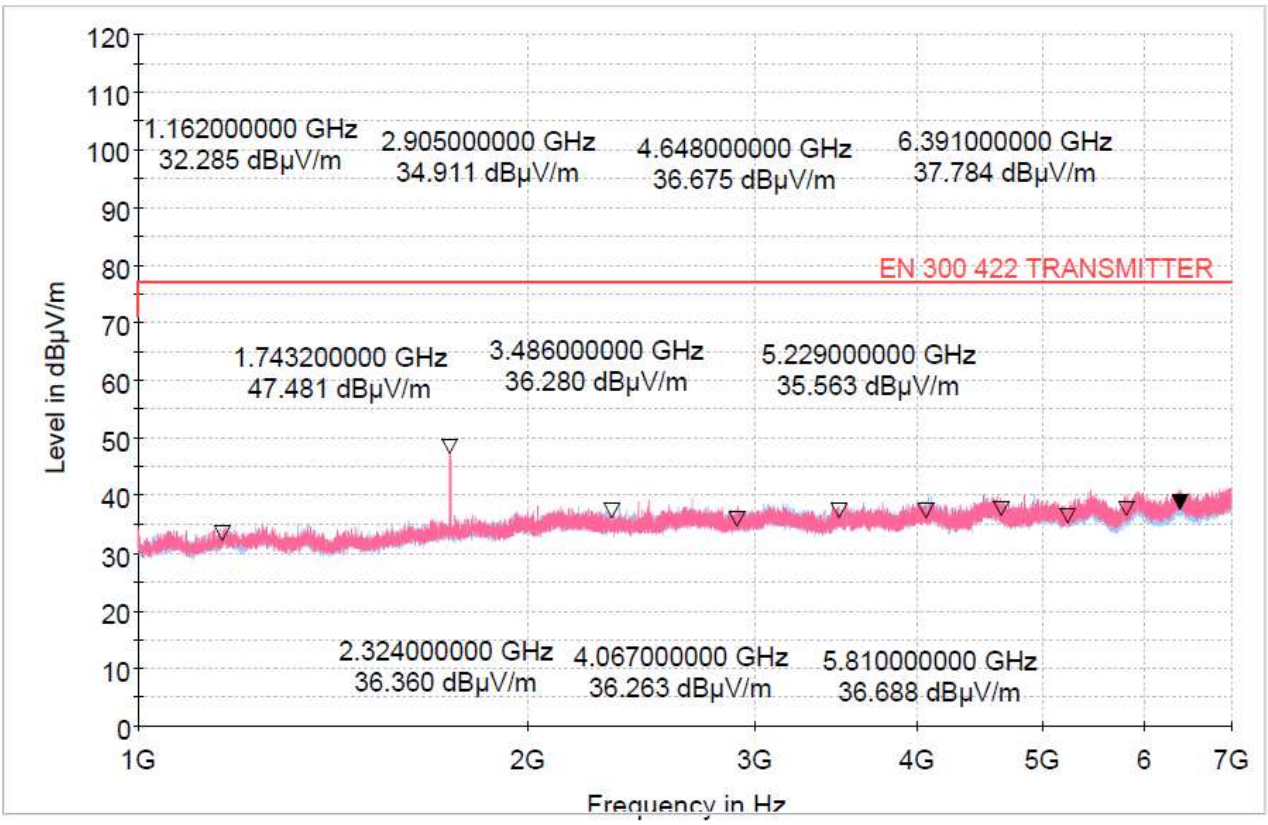
	@ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 3.36 SP2, CAL 5/28/2016
Signal Path:	Receiver-EMI to 18 GHz FW 1.0 Correction Table: Receiver-EMI Antenna WITH 18GHz L23_041_38 8m
Antenna:	EMI3117-PA 200385 SN 200385, CAL 10/16/2018 Correction Table (vertical): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (horizontal): Horn ETS 3117-PA 200363 2017 10 16 Correction Table (vertical): L23_041_47 Cable Correction Table (horizontal): L23_041_47 Cable
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Full Spectrum



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
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Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
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SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	Radiated Emissions FCC Part 74 30MHz - 1GHz
EUT:	P10TB J8
Serial Number:	3258F31970
Project Name:	
Operating Frequency:	Carrier 1: 581.00MHz & Carrier 2: Off
Power Level / Mod Mode:	100mW
EUT Configuration:	Channel 1 RF ON, Chennel 2 RF OFF. All ports loaded.
Comment:	Headphones connected
Name:	Jamal Qureshi
Date Tested	November 2, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC74-EN300422 Transmitter 30MHz to 1GHz 34790

Hardware Setup:	Electric Field Strength 34790
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test EN300422 Transmitter 25MHz 1GHz 34790 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 34790 FINAL

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 34790 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
25 MHz - 30 MHz	2.25 kHz	AVG	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	AVG	120 kHz	1 s	0 dB

Hardware Setup: EMI radiated\Electric Field Strength 34790 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz

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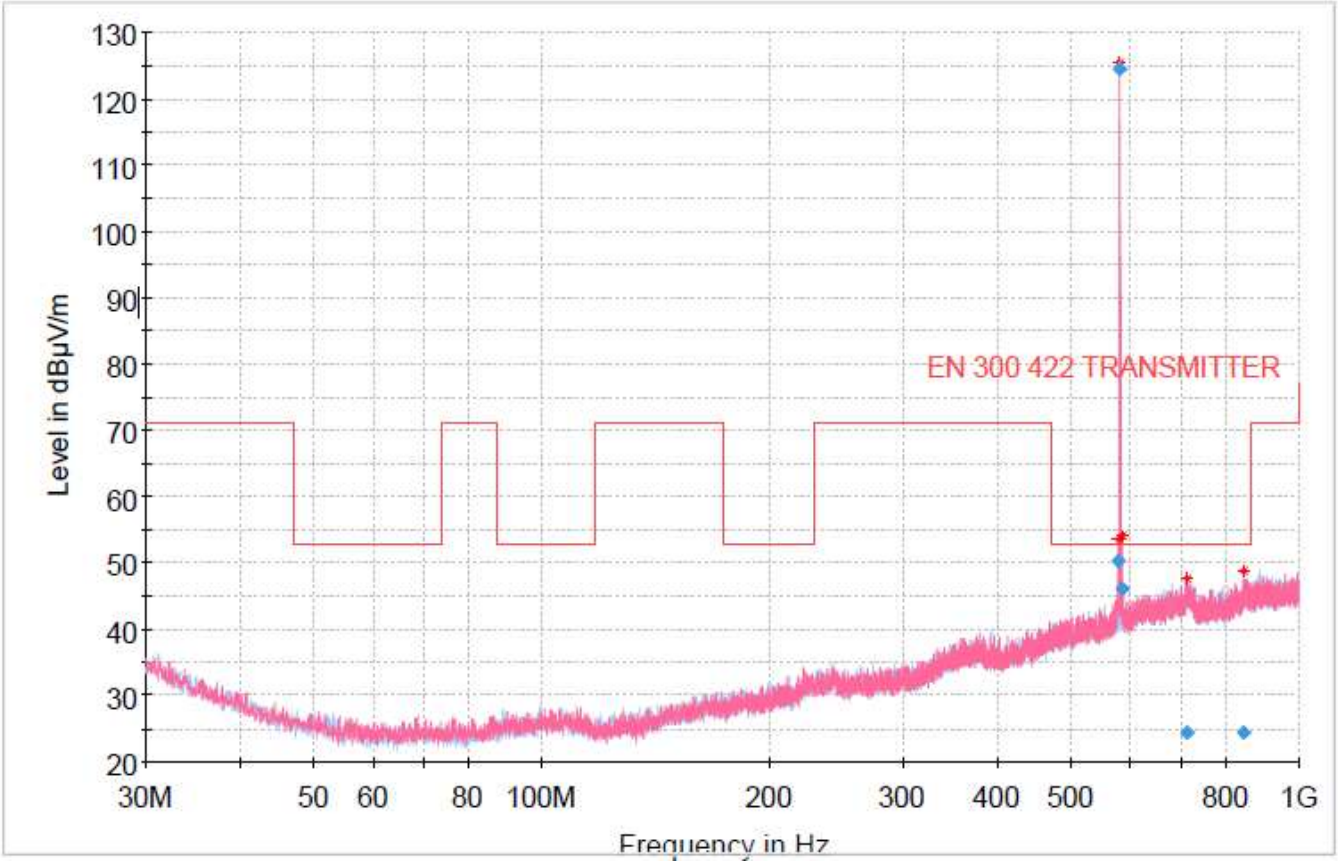
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 3.36 SP2, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna WITH 18GHz L23_041_38 8m
Antenna:	ETS 3142C 34790 SN 34790, CAL 5/17/2019 Correction Table (vertical): BiconiLog 3142C Hor-34790 2017 06 17 Correction Table (horizontal): BiconiLog 3142C Hor-34790 2017 06 17
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21

Full Spectrum



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
577.662000	53.54	---	53.00	-0.54	---	---	103.0	V	192.0	22.4	12:38:06 PM - 11/2/2018
580.992333	125.46	---	53.00	-72.46	---	---	103.0	V	182.0	22.5	12:39:05 PM - 11/2/2018
584.355000	54.14	---	53.00	-1.14	---	---	114.0	V	181.0	22.6	12:40:05 PM - 11/2/2018
710.681333	47.65	---	53.00	5.35	---	---	125.0	V	175.0	24.6	12:41:22 PM - 11/2/2018
844.864667	48.74	---	53.00	4.26	---	---	274.0	H	191.0	26.1	12:36:52 PM - 11/2/2018

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
577.662000	50.19	53.00	2.81	1000.0	120.000	103.0	V	192.0	22.4	12:38:13 PM - 11/2/2018
580.992333	124.52	53.00	-71.52	1000.0	120.000	103.0	V	182.0	22.5	12:39:12 PM - 11/2/2018
584.355000	46.04	53.00	6.96	1000.0	120.000	114.0	V	181.0	22.6	12:40:12 PM - 11/2/2018
710.681333	24.43	53.00	28.57	1000.0	120.000	125.0	V	175.0	24.6	12:41:32 PM - 11/2/2018
844.864667	24.32	53.00	28.68	1000.0	120.000	275.0	H	191.0	26.1	12:36:57 PM - 11/2/2018

SHURE Radiated RF Emissions Test Report

Common Information

Test Description:	Radiated Emissions FCC Part 74 30MHz - 1GHz
EUT:	P10TB J8
Serial Number:	3258F31970
Project Name:	
Operating Frequency:	Carrier 1: 581.00MHz & Carrier 2: Off
Power Level / Mod Mode:	100mW
EUT Configuration:	Channel 1 RF ON, Chennel 2 RF OFF. All ports loaded.
Comment:	Headphones connected
Name:	Jamal Qureshi
Date Tested	November 2, 2018

EMI Auto Test Template: COMPLIANCE TEST FCC74-EN300422 Transmitter 30MHz to 1GHz 34790

Hardware Setup:	Electric Field Strength 34790
Measurement Type:	Open-Area-Test-Site
Frequency Range:	30 MHz - 1 GHz
Graphics Level Range:	0 dBµV/m - 120 dBµV/m

Preview Measurements:

Antenna height:	100 - 400 cm , Step Size = 50 cm , Positioning Speed = 6
Polarization:	H + V
Turntable position:	0 - 360 deg , Continuously , Measuring Speed = 5
Graphics Display:	Show separate traces for horizontal and vertical polarization
Sweep Test Template:	Compliance Test EN300422 Transmitter 25MHz 1GHz 34790 PREVIEW

Adjustment:

Antenna height:	Range = 50 cm , Measuring Speed = 1
Turntable position:	Range = 90 deg , Measuring Speed = 5
Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 34790 FINAL

Final Measurements:

Template for Single Meas.:	COMPLIANCE TEST EN300422 Transmitter 25 to 1000 MHz 34790 FINAL

Subrange	Step Size	Detectors	IF BW	Meas. Time	Preamp
Receiver: [ESR 26]					
25 MHz - 30 MHz	2.25 kHz	AVG	9 kHz	1 s	0 dB
30 MHz - 1 GHz	30 kHz	AVG	120 kHz	1 s	0 dB

Hardware Setup: EMI radiated\Electric Field Strength 34790 - [EMI radiated]

Subrange 1

Frequency Range:	25 MHz - 1 GHz

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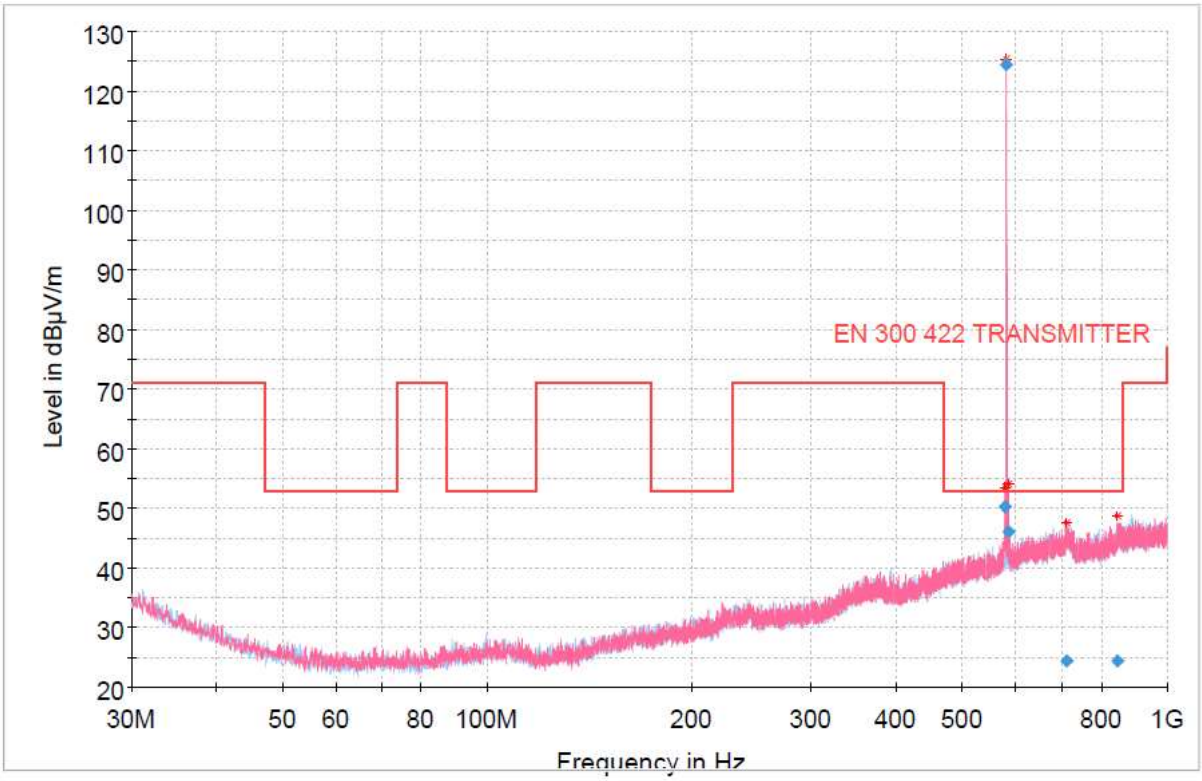
Receiver:	ESR 26 [ESR 26] @ GPIB0 (ADR 20), SN 1316.3003K26/101347, FW 3.36 SP2, CAL 5/28/2016
Signal Path:	Receiver-EMI to 1 GHz FW 1.0 Correction Table: Receiver-EMI Antenna WITH 18GHz L23_041_38 8m
Antenna:	ETS 3142C 34790 SN 34790, CAL 5/17/2019 Correction Table (vertical): BiconiLog 3142C Hor-34790 2017 06 17 Correction Table (horizontal): BiconiLog 3142C Hor-34790 2017 06 17
Antenna Tower:	Tower [EMCO 2090 Antenna Tower] @ GPIB0 (ADR 8), FW REV 3.21
Turntable:	Turntable [EMCO Turntable] @ GPIB0 (ADR 9), SN 29799, FW REV 3.21



Critical_Freqs

Frequency (MHz)	MaxPeak (dBµV/m)	DET 2 (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
577.662000	53.54	---	53.00	-0.54	---	---	103.0	V	192.0	22.4	12:38:06 PM - 11/2/2018
580.992333	125.46	---	53.00	-72.46	---	---	103.0	V	182.0	22.5	12:39:05 PM - 11/2/2018
584.355000	54.14	---	53.00	-1.14	---	---	114.0	V	181.0	22.6	12:40:05 PM - 11/2/2018
710.681333	47.65	---	53.00	5.35	---	---	125.0	V	175.0	24.6	12:41:22 PM - 11/2/2018
844.864667	48.74	---	53.00	4.26	---	---	274.0	H	191.0	26.1	12:36:52 PM - 11/2/2018

Final_Result

Frequency (MHz)	Average (dBµV/m)	Limit (dBµV/m)	Margin (dB)	Meas. Time (ms)	Bandwidth (kHz)	Height (cm)	Pol	Azimuth (deg)	Corr. (dB/m)	Comment
577.662000	50.19	53.00	2.81	1000.0	120.000	103.0	V	192.0	22.4	12:38:13 PM - 11/2/2018
580.992333	124.52	53.00	-71.52	1000.0	120.000	103.0	V	182.0	22.5	12:39:12 PM - 11/2/2018
584.355000	46.04	53.00	6.96	1000.0	120.000	114.0	V	181.0	22.6	12:40:12 PM - 11/2/2018
710.681333	24.43	53.00	28.57	1000.0	120.000	125.0	V	175.0	24.6	12:41:32 PM - 11/2/2018
844.864667	24.32	53.00	28.68	1000.0	120.000	275.0	H	191.0	26.1	12:36:57 PM - 11/2/2018

P10TB J8 Below 1GHz Substitution Data Average							
Frequency (MHz)	Frequency Type	Signal Generator Level (dBm)	Cable Loss (dBm)	SIG + Cable (dBm)	ERP (dBuV/m)	Limit Line (dBuV/m)	Margin (dBuV/m)
577.662000	Harmonic	-52.42	2.47	-54.89	42.49	53	10.51
584.646000	Harmonic	-52.55	2.55	-55.1	42.28	53	10.72

Appendix B: Necessary Bandwidth

B.1. Purpose:

This test was performed to determine if the EUT meets the necessary bandwidth requirements of FCC Part 74.861(e)(7) and RSS 210.9.

B.2. Requirements:

As stated in paragraph 74.861(e)(7), for low power auxiliary stations operating in the 600MHz duplex gap and the bands allocated for TV broadcasting, the following technical requirements apply:

"Analog emissions within the band from one megahertz below to one megahertz above the carrier frequency shall comply with the emission mask in section 8.3.1.2 of the European Telecommunications Institute Standard ETSI EN 300 422-1 v1.4.2 (2011-08), Electromagnetic compatibility and Radio spectrum Matters (ERM); Wireless microphones in the 25 MHz to 3 GHz frequency range; part 1: Technical characteristics and methods of measurement."

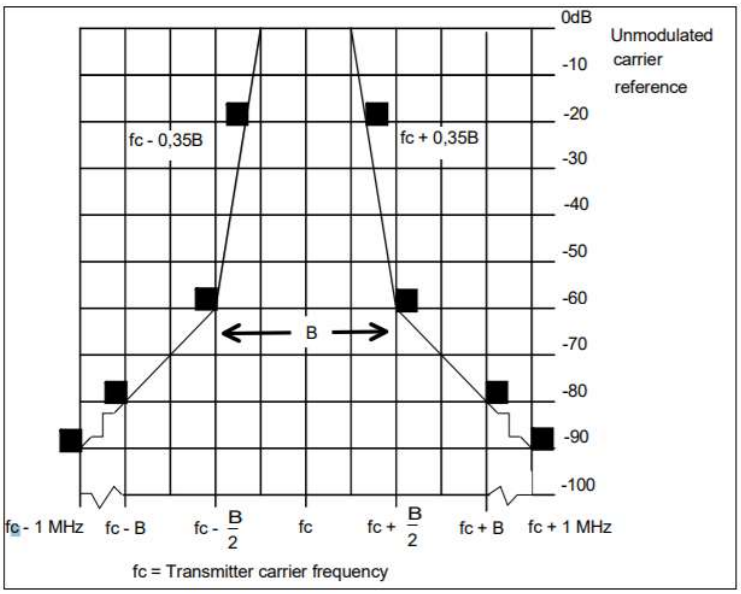


Figure 2: Spectrum mask for analogue systems in all bands - ETSI EN 300 422-1

As stated in RSS 210.9, "The occupied bandwidth for low-power radio apparatus shall not exceed the authorized bandwidth
specified in Table G1."

Table G1 — Specification for Low-Power Radio Apparatus

Frequency Bands (MHz)	Transmit e.i.r.p. (mW)	Authorized Bandwidth (kHz)	Frequency Stability (ppm)
54-72 76-88 174-216	50	200	± 50
470-608 614-698[Note]	250	200	± 50

Note: Effective May 25, 2018, the Department will no longer accept applications for the certification of new low-power apparatus that operate in the bands 617-652 MHz and 663-698 MHz. Furthermore, as of November 15, 2018, no low-power apparatus in the bands 617-652 MHz and 663-698 MHz may be sold, offered for sale, manufactured, imported, distributed or leased on the Canadian market.

B.3. 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):

	Std uncertainty	
	+u(%)	-u(%)
Expanded Uncertainty (U_{95}):	**0.130**	**0.130**

These values can be found in the document titled 'Occupied Bandwidth Max Input Freq Above 3kHz.xlsx' located at *\\shure.com\organization\Quality\Product Conformance-Lab Services\Global Compliance\Shure EMC Lab\Controlled Documents\Measurement Uncertainties.*

B.4. Test Setup and Instrumentation:

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

Audio precision
SYS-2722
192 k
ANALOG OUTPUT A
ANALOG OUTPUT B
ANALOG INPUT A
ANALOG INPUT B
DIGITAL OUTPUT
DIGITAL INPUT
GENERATOR MONITORS
ANALYZER SIGNAL MONITORS
GENERATOR AUX SIGNALS
DIGITAL SIGNAL MONITORS

ETSI
NOISE
FILTER
L23-040-22
EMC LAB
L23-040-32
EMC LAB

B.5. EUT Operation:

The device was powered on and set to the test frequency (581.000MHz) using the buttons on the front of the device.

B.6. Specific Test Procedures:

The device was tested using procedures outlined in EN 300 422-1 part 8.3.2.1 as listed below.

"The arrangement of test equipment as shown in figure B.1 shall be used. Note that the noise meter conforms to (quasi peak) without weighting filter (flat).

With the Low Frequency (LF) audio signal generator set to 500 Hz, the audio input level to the DUT shall be adjusted to 8 dB below the limiting threshold (-8 dB (lim)) as declared by the manufacturer.

The corresponding audio output level from the demodulator shall be measured and recorded.

The input impedance of the noise meter shall be sufficiently high to avoid more than 0,1 dB change in input level when the meter is switched between input and output.

The audio input level shall be increased by 20 dB, i.e. to +12 dB (lim), and the corresponding change in output level shall be measured.

It shall be checked that the audio output level has increased by ≤ 10 dB.

If this condition is not met, the initial audio input level shall be increased from -8 dB (lim) in 1 dB steps until the above condition is fulfilled, and the input level recorded in the test report. This level replaces the value derived from the manufacturer's declaration and is defined as -8 dB (lim).

Measure the input level at the transmitter required to give +12 dB (lim).

The LF generator shall be replaced with the weighted noise source to Recommendation ITU-R BS.559-2 [i.3], band-limited to 15 kHz as described in IEC 60244-13 [2], and the level shall be adjusted such that the measured input to the transmitter corresponds to +12 dB (lim).

If the transmitter incorporates any ancillary coding or signalling channels (e.g. pilot-tones), these shall be enabled prior to any spectral measurements.

If the transmitter incorporates more than one audio input, e.g. stereo systems, the second and subsequent channels shall be simultaneously driven from the same noise source, attenuated to a level of -6 dB (lim).

The transmitter RF output spectrum shall be measured, using a spectrum analyser with the following settings:

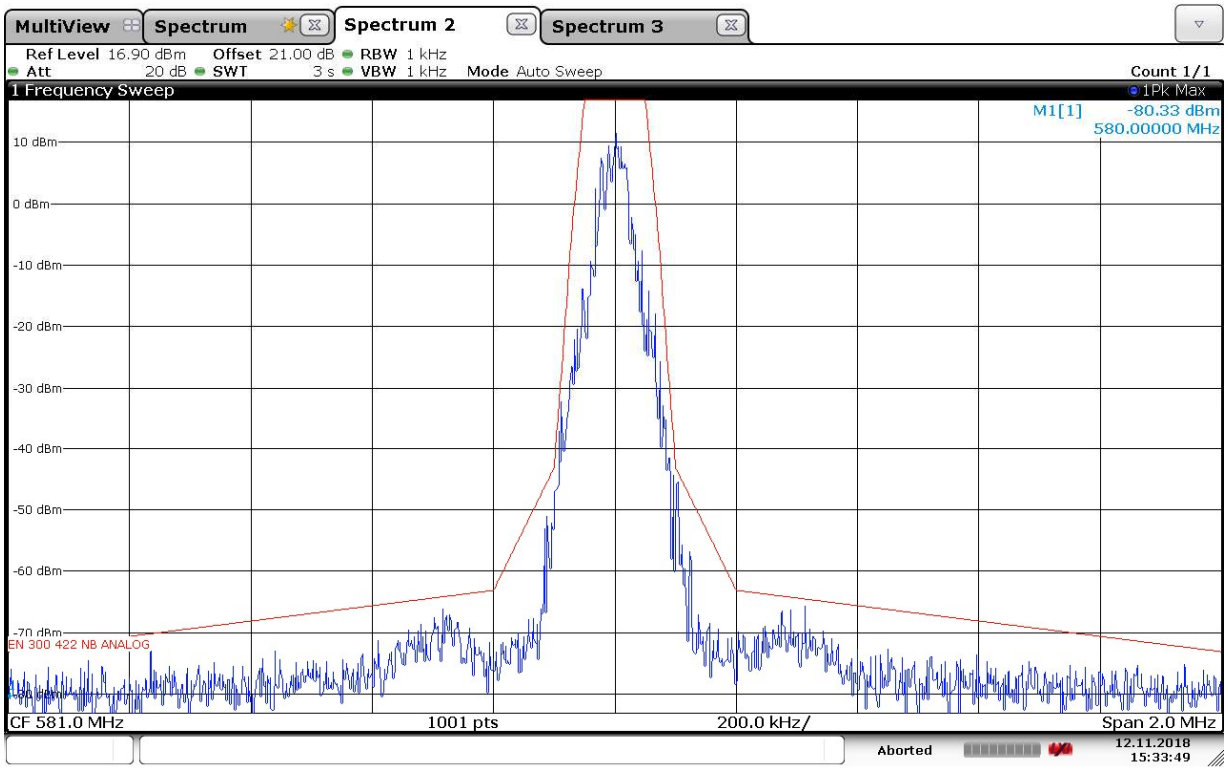
- centre frequency: fc: Transmitter (Tx) nominal frequency;
- dispersion (Span): fc - 1 MHz to fc + 1 MHz;
- Resolution BandWidth (RBW): 1 kHz;
- Video BandWidth (VBW): 1 kHz;
- detector: Peak hold.

Figure 8 shows the spectrum mask for all analogue systems in the band. The -90 dBc point shall be ±1 MHz from fc measured with an average detector. To comply, a measured value shall fall below the mask limit."

A +12dB level of -28dBV and a -8dB level of -48dBV were chosen using the first set of instructions, and the output RF power was measured with inputs of -28dBV for the +12dB level and -46dBV for the -6dB level.

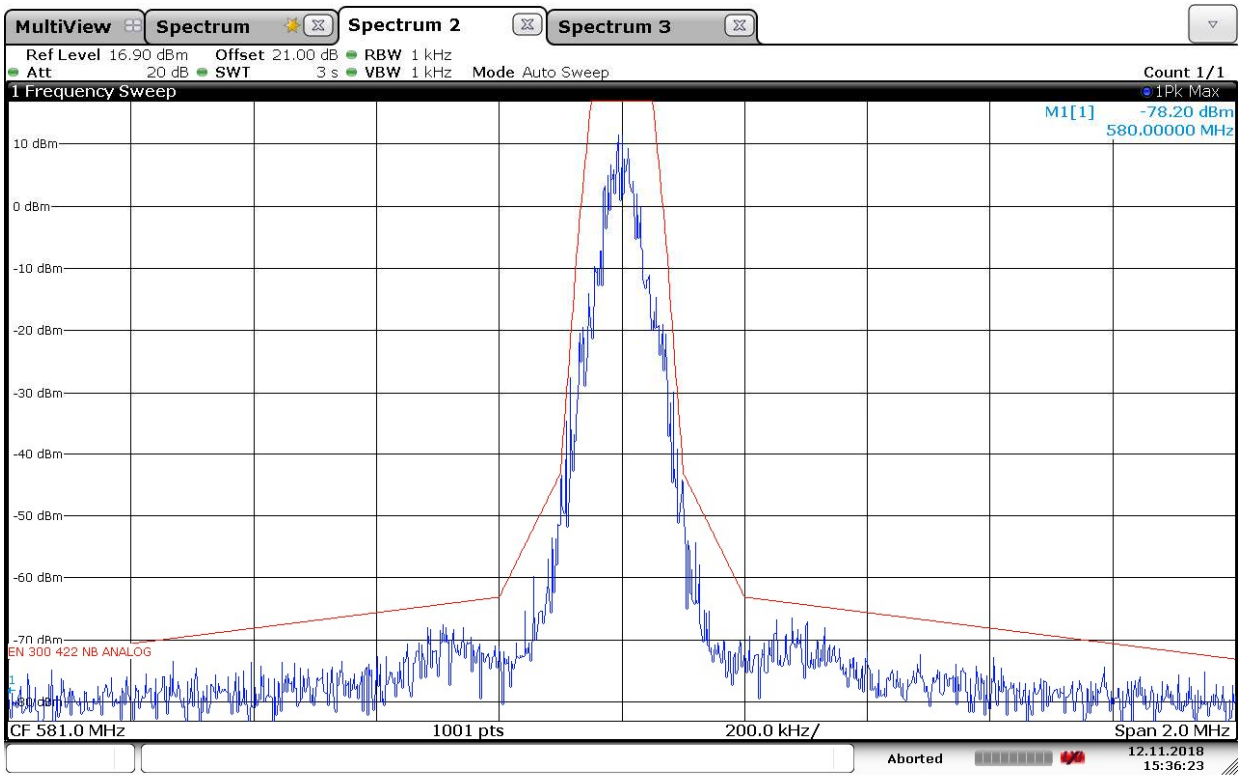
B.7. Results:

The necessary bandwidth data are presented on the following pages. Data are shown as the maximum relative level of the output level within the emission mask. As shown by the test data, the necessary bandwidth of the EUT meets the requirements of FCC Part 74 and RSS210.9.



15:33:50 12.11.2018

Figure 3: Necessary Bandwidth Measurement at 581.000MHz – Output 1



15:36:23 12.11.2018

Figure 4: Necessary Bandwidth Measurement at 581.000MHz – Output 2

Appendix C: RF Output Power

C.1. Purpose:

This test was performed to determine if the EUT meets the RF power output requirements of FCC Part 74.861(d)(1) and RSS 210.9.

C.2. Requirements:

As stated in FCC 74.861(d)(1), for all bands except the 1435-1525 MHz band, the maximum transmitter power which will be authorized is 1 watt.

As stated in RSS 210.9, transmitter EIRP shall be limited to the values listed in Table G1 below, or 250 mW.

Table G1 — Specification for Low-Power Radio Apparatus

Frequency Bands (MHz)	Transmit e.i.r.p. (mW)	Authorized Bandwidth (kHz)	Frequency Stability (ppm)
54-72 76-88 174-216	50	200	± 50
470-608 614-698[Note]	250	200	± 50

Note: Effective May 25, 2018, the Department will no longer accept applications for the certification of new low-power apparatus that operate in the bands 617-652 MHz and 663-698 MHz. Furthermore, as of November 15, 2018, no low-power apparatus in the bands 617-652 MHz and 663-698 MHz may be sold, offered for sale, manufactured, imported, distributed or leased on the Canadian market.

C.3. 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.

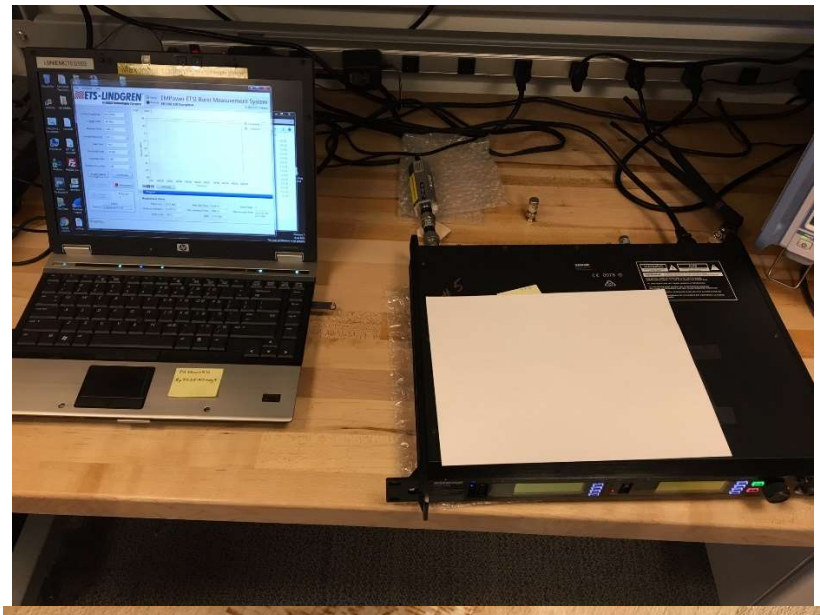
Values of Expanded Measurement Uncertainty (95% Confidence):

	Std uncertainty +u(dB)	-u(dB)
Expanded Uncertainty (U_{95}):	**0.461**	**0.461**

These values can be found in the document titled 'Carrier Power w ETS Power Meter (L23-045-36).xlsx' located at *\\shure.com\organization\Quality\Product Conformance-Lab Services\Global Compliance\Shure EMC Lab\Controlled Documents\Measurement Uncertainties.*

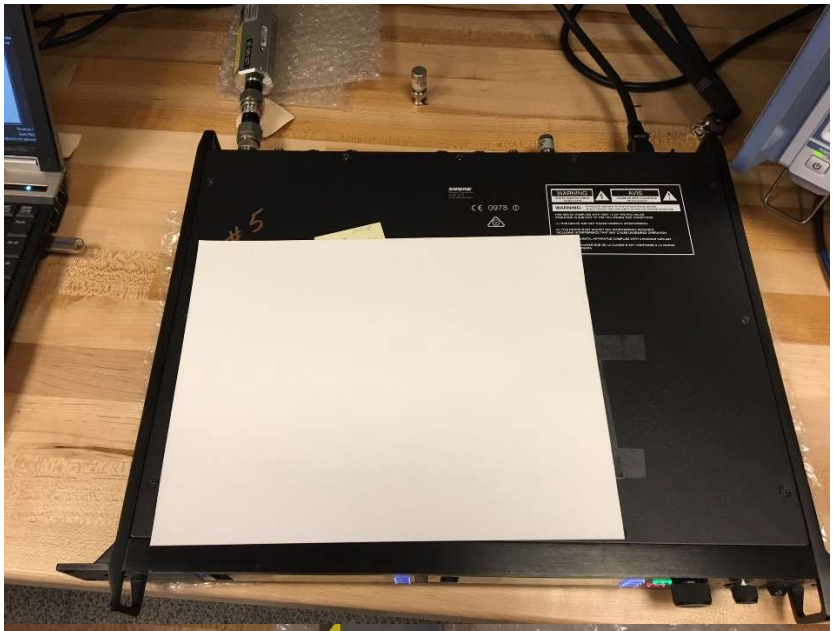
C.4. Test Setup and Instrumentation:

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

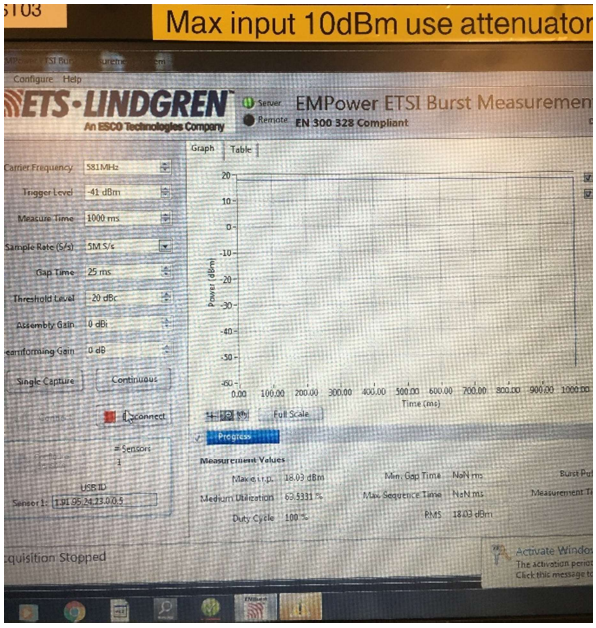

ETS-LINDGREN

Fox Valley Metrology
CH51-55272-435
By: A. Smith
ID: L23-040-03
Loc: N/A
Date: 05/31/2018
Due: 05/31/2020
Item ID: 46410-1059

Shure
581.000MHz
G:-- Ch:--
TV: 32
100mW
Lvl:-16dB
St Aux
Radio
Audio
Util
Sync



L23-045-36
Item ID: 46410-1059



C.5. EUT Operation:

The EUT was powered up and the transmit frequency (581.000MHz) and the power output levels (10mW, 50mW, and 100mW) of the transmitter were selected using the front panel controls.

C.6. Specific Test Procedures:

a. The EUT's RF Out 1 was connected to an artificial antenna at ambient temperature.
b. The EUT's frequency was set at the test frequency (581.000MHz).
c. The power level was measured and recorded.
d. Step b) was repeated at all power levels (10mW, 50mW, and 100mW).
e. The above procedure was then repeated for the second RF output.

C.7. Results:

The device performed within the bounds set by FCC Part 74.861(e)(7) and RSS 210.9 Annex G. The following tables detail the output power at each frequency, tested at 10, 50, and 100mW compared to the FCC and IC limits. The first table shows the values for RF Output 1 and the second is for RF Output 2 on the stereo device.

Unit#	Frequency (MHz)	Nominal Power (mW)	Measured Power (dBm)	Measured Power (mW)	FCC Limit (mW)	IC Limit (mW)
RF Out1 **J8A**	581.000	10	7.83	6.07	1000	250
	581.000	50	14.96	31.33	1000	250
	581.000	100	18.02	63.39	1000	250

Unit#	Frequency (MHz)	Nominal Power (mW)	Measured Power (dBm)	Measured Power (mW)	FCC Limit (mW)	IC Limit (mW)
RF Out2 **J8A**	581.000	10	7.79	6.01	1000	250
	581.000	50	14.82	30.34	1000	250
	581.000	100	17.85	60.95	1000	250